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1977

SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 10, NUMBER 5
MARCH 1, 1977

W77-02076 -- W77-02575

e Secretary of the U.S. Department of the Interior has de-
mined that the publication of this periodical is necessary in the
nsaction of the public business required by law of this Depart-
ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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01 NATURE OF WATER
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02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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04 WATER QUANTITY MANAGEMENT AND CONTROL
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

CONFIGURATION INTERACTION STUDIES OF THE EXCITED STATES OF WATER,
Aerospace Corp., El Segundo, Calif.
N. W. Winter, W. A. Goddard, III, and F. W. Bobrowicz.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A010 599, Price codes: A03 in paper copy, A01 in microfiche. Report No. SAMSO-TR-75-129, April 15, 1975. 29 p, 4 tab, 40 ref. F04701-74-C-0075.

Descriptors: *Water chemistry, *Water properties, *Molecular structure, *Mathematical studies, *Water structure, Equations, Laboratory tests.
Identifiers: *Excited states, *Water molecule, *Configuration interactions, *Electron impact excitation, *Transition energies, Electron orbitals, Excitation energies, Rydberg constant, Electron impact spectra.

The results of extensive configuration interaction studies of 16 excited states of water were reported. These states can be accurately described as corresponding to excitation from one of the highest two molecular orbitals (1b sub 1 or 3a sub 1) of the ground state into either the 3s or one of the three 3p Rydberg orbitals. The results provide the most accurate and consistent treatment of these states to date (within 0.1 eV for all known transitions) and form a reliable basis for the assignment of the photon and electron impact spectra of H2O. (Henley-ISWS)
W77-02153

2. WATER CYCLE

2A. General

UTILITY OF URBAN RUNOFF MODELING, (PROCEEDINGS OF A SPECIAL SESSION, SPRING ANNUAL MEETING, AMERICAN GEOPHYSICAL UNION, WASHINGTON, D.C. 14 APRIL 1976.
American Society of Civil Engineers, New York.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 460, Price codes: A07 in paper copy, A01 in microfiche. ASCE, Urban Water Resources Research Program Technical, Memorandum No. 31, July, 1976, 126 p., 8 tab., 32 fig., 99 ref. OWRT C-5045(No. 4224)(7).

Descriptors: *Urbanization, *Urban runoff, *Computer models, *Local governments, *Water pollution sources, *Project planning, *Automatic control, *Design, Data collections, Storm drains, Water quality control, Land use, United States, Rainfall-runoff relationships, Forecasting, Detention reservoirs, Canada, Australia, Combined sewers, Simulation analysis, Cities, *Urban drainage, Mathematical models, Model studies.
Identifiers: *Urban rainfall-runoff-quality relationships, Storm sewer discharges, Combined sewer overflows, Urban runoff gaging, Federal Republic of Germany.

The proceedings of a Special Session, Spring Annual Meeting, American Geophysical Union, Washington, D.C., 14 April 1976 include three invited papers by a Panel on Local Government Model Use and Need, seven related invited papers, two written discussions, and the full text of all Session floor discussion. A third of the about 60 participants contributed to the floor discussion, which occupied two-fifths of the total Session duration. The thrust of the Session was an attempt to define reasons why mathematical models of urban runoff should be used more extensively and more effectively in local government projects; that is, why the use of more sophisticated models would be more cost-effective than simpler, traditional procedures. Rationales were identified for planning, design and automatic control applications. The Session provided an outstanding opportunity for communication between users of the findings of research products and science-oriented researchers.
W77-02076

A MODEL FOR PREDICTING FLOOD HAZARDS DUE TO SPECIFIC LAND-USE PRACTICES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
B. B. Ross, D. N. Contractor, E. A. Li, V. O. Shanholtz, and J. C. Corr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 389, Price codes: A06 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 99, September 1976, 118 p, 36 fig, 18 tab, 99 ref. OWRT A-062-VA(2).

Descriptors: *Overland flow, *Channel flow, *Computer models, Infiltration, Land use, *Finite element analysis, Model studies, *Virginia, *Precipitation excess, Hurricanes, Simulation analysis, *Flood forecasting, Watershed management, Rainfall-runoff relationships.
Identifiers: *Hydrologic response units, *Hurricane Camille, Flood hazards, *South River watershed(VA).

This investigation developed a finite element model for mathematically routing overland and channel flow when rainfall excess is known. To determine rainfall excess, a procedure was developed to subdivide a drainage area into similarly responding units, defined as hydrologic response units. These units were functions of soil texture, soil depth, land use, and hydrology group classification. A computer model, based on the Mein and Larson and Holtan infiltration equations, was developed to generate excess precipitation for each hydrologic response unit. A finite element grid, devised for both the watershed and the main streams, allowed use of the hydrologic response units within an element to obtain weighted rainfall excess values for each element. A one-dimensional finite element scheme, in conjunction with Galerkin's residual method, simulated overland and open channel flow. Hurricane Camille (August 1969) provided an event by which the model was tested and calibrated on the South River watershed in Augusta County, Virginia. Having the ability to report changes in land use, the finite element procedure allowed several arbitrary land-use changes to be incorporated into the model in order to observe the river's response under flood conditions. The effects of changes in the number and size of the elements in the watershed and in the streams also were observed, along with changes in the size of the time increment.
W77-02078

AN ANALYSIS OF THE EFFECTS OF PARAMETER UNCERTAINTY IN DETERMINISTIC HYDROLOGIC MODELS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
E. F. Wood.
Water Resources Research, Vol. 12, No. 5, p 925-932, October 1976. 12 fig, 1 tab, 6 ref.

Descriptors: *Parametric hydrology, *Model studies, Analytical techniques, *Flood frequency, *Simulation analysis, *Rainfall-runoff relationships, Stochastic processes, Water resources, Water loss, Systems analysis, Equations, Risks.
Identifiers: *Deterministic models.

The uncertainty in the output of deterministic models, due to the uncertainty in the parameters of the model, is analyzed and compared to current procedures of using average values for the uncertain parameters. The present analysis considers an analytical rainfall-runoff flood frequency model where the infiltration parameter is considered as a stochastic variable. The same conceptual procedure can be used to analyze fixed but uncertain (unknown) parameters. The extension to analyzing parameter uncertainty in large simulation models is indicated, and the importance of such analyses is discussed. (Bell-Cornell)
W77-02125

SIMULATION OF ROOT-ZONE WATER AND DEEP SEEPAGE TO A WATER TABLE,
Connell/Metcalf and Eddy, Coral Gables, Fla.
For primary bibliographic entry see Field 2G.
W77-02295

SELECTION OF STREAMFLOW AND RESERVOIR-RELEASE MODELS FOR RIVER-QUALTIY ASSESSMENT,
Geological Survey, Jackson, Miss.; and Geological Survey, Lakewood, Colo. Water Resources Div.
M. E. Jennings, J. O. Shearman, and D. P. Bauer.
Available from Branch of Distribution, USGS, 1200 S. Eads St., Arlington, VA, 22202. Circular 715-E, 1976. 11 p, 4 fig, 1 tab, 35 ref.

Descriptors: *Mathematical models, *Streamflow, *Reservoir releases, Model studies, Methodology, Reviews, Project planning, Water quality control, Hydrology, Evaporation.
Identifiers: Flow routing.

Sound water-resource planning requires consideration of realistic alternatives. Digital models, based on hydraulic and hydrologic principles and utilizing adequate input data, can be used to simulate the response(s) of a water-resource system to various alternatives. Streamflow and reservoir modeling methods are reviewed, including a discussion of general data requirements. Guidelines for model selection are presented with both hypothetical and actual studies used to illustrate possible selection procedures. (Woodard-USGS)
W77-02302

COMPARISON OF LINEAR SYSTEMS AND FINITE DIFFERENCE FLOW-ROUTING TECHNIQUES,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-02319

MATHEMATICAL MODELS IN HYDRAULICS AND COASTAL ENGINEERING,
International Courses in Hydraulic and Sanitary Engineering, Delft (Netherlands).
M. B. Abbott.
Terra et Aqua, No. 11, p 8-17, 1976. 13 fig, 12 ref.

Descriptors: *Mathematical models, *Mathematical studies, *Hydraulics. *Coastal engineering, Model studies, Research and development, Design, Hydrologic data, Mathematics, Environment.
Identifiers: *One dimensional, *Two dimensional, Model calibration, Three dimensional.

The paper described various aspects of mathematical models and their applications in hydraulics and coastal engineering problems. Mathematical models were advocated not as a replacement for physical modeling, but as a complementary tool to solve hydraulic problems. It was pointed out that the possibilities of making serious errors are much greater with the mathematical approach. It was also emphasized that mathematical modeling

should be integrated closely with the rest of the investigation and design process which implied that the organizations best suited to build these models are the ones that possess extensive facilities for field measurements, laboratory testing, instrument development, data processing, and problem analysis. (Bhowmik-ISWS)
W77-02471

2B. Precipitation

SYNTHETIC DESIGN HYETOGRAPH AND RATIONAL RUNOFF COEFFICIENT,
American Consulting Services, Inc., Minneapolis, Minn. Environmental Engineering.
For primary bibliographic entry see Field 2E.
W77-02135

PROGRAM REPORT-FY 1975, ATMOSPHERIC AND GEOPHYSICAL SCIENCES DIVISION, PHYSICS DEPARTMENT.
California Univ., Livermore. Lawrence Livermore Lab.
Report UCRL-51444-75, October 8, 1975. 36 p, 11 fig, 42 ref, 2 append. ERDA W-7405-Eng-48.

Descriptors: *Projects, *Model studies, *Atmosphere, Mathematical models, Air pollution, Climatology, Nuclear wastes, Nuclear explosions, Remote sensing, Satellites(Artificial), Precipitation(Atmospheric), Forests, Dusts, Boundary layers, Meteorology.

The FY 1975 research program conducted by the Atmospheric and Geophysical Sciences Division and supporting segments at Lawrence Livermore Laboratory was reviewed briefly. Specific projects were described, and significant findings of the work were indicated. Unique numerical modeling capabilities in use and under development were described; these tools can be brought to bear on many energy-environmental relationships and problems. (Sims-ISWS)
W77-02157

PRECIPITATION ON INTERMOUNTAIN RANGELAND IN THE WESTERN UNITED STATES,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
K. G. Renard, and D. L. Brakensiek.
In: Watershed Management on Range and Forest Lands. Proceedings, 5th Workshop of the United States/Australia Rangelands Panel, Boise, Idaho, June 15-22, 1975. Utah Water Research Laboratory, College of Engineering, Utah State University, Logan, Utah. p 39-59, 14 fig, 4 tab, 49 ref.

Descriptors: *Rainfall, *Rainfall disposition, *Rain gages, *Ranges, Seasonal, Rainfall intensity, Atmospheric pressure, Orography, Thunderstorms, Depth-Area-Duration analysis, Snowfall, Weather patterns, Photogrammetry, Precipitation(Atmospheric).

Precipitation varies widely in basin and range areas as well as major mountain areas in most of the western United States rangeland. Precipitation characteristics depend on the atmospheric moisture source, season, elevation and other factors. Much of the winter moisture in western rangeland areas is due to Pacific Ocean moisture carried into the area by prevailing westerly winds; such winds may cause orographic precipitation patterns with more rainfall and snow at high elevations. In other seasons, and especially in the southwestern U.S., atmospheric moisture results from slow air movement from the Bermuda high pressure area toward a thermal low pressure area; thunderstorms are common under such conditions. These and other rainfall events are discussed. Orographic precipitation patterns, redistribution of blowing snow and small thunderstorms contribute to the steep isohyetal gradients and limit rain gage data except at the point considered. Other topics considered include distribution of rainfall depths, thunderstorm patterns, low elevation winter precipitation, measurement by a dual gage system and by photogrammetry, and snowmelt studies. (Jahns-Arizona)
W77-02179

INADVERTENT WEATHER MODIFICATION,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 3B.
W77-02453

CLIMATIC INFERENCES FROM FORMER GLACIERS IN THE SOUTH-EAST GRAMPIAN HIGHLANDS, SCOTLAND,
Edinburgh Univ., (Scotland). Dept. of Geography.
For primary bibliographic entry see Field 2C.
W77-02467

THE ANNUAL VOLUME OF U.S. PRECIPITATION AND ITS VARIATIONS FOR THE PERIOD 1931-1971,
Eastern Washington State College, Cheney. Dept. of Physics.
J. R. Marshall.
Journal of Geophysical Research, Vol. 81, No. 24, p 4485-4486, August 20, 1976. 1 fig, 2 tab, 2 ref.

Descriptors: *Precipitation(Atmospheric), *Annual, *United States, Volume, Average, Fluctuations, Weather, Droughts, Wet seasons, Variability, Climatology.
Identifiers: *Precipitation variations.

The average annual volume of United States precipitation was calculated to be 5759 cu km for the 41-yr period from 1931 through 1971 inclusive. The standard deviation was + or - 7.1%. The extremes were 15% (1957) and -14% (1956). A significant conclusion was that wet years are more numerous than dry years; but, on the average, dry years are drier than wet years are wet. (Sims-ISWS)
W77-02483

A TECHNIQUE FOR ESTIMATING TROPICAL OPEN-OCEAN RAINFALL FROM SATELLITE OBSERVATIONS,
Hawaii Univ., Honolulu. Dept. of Meteorology.
B. J. Kilonsky, and C. S. Ramage.
Journal of Applied Meteorology, Vol. 15, No. 9, p 972-975, September 1976. 5 fig, 13 ref. NSF DES 74-22685.

Descriptors: *Remote sensing, *Rainfall, *Oceans, *Pacific Ocean, Satellites(Artificial), Analytical techniques, Data processing, Correlation analysis, Estimating, Clouds, Storms, Meteorology.

A procedure has been devised for extracting the frequency of highly reflective clouds from visual satellite picture mosaics of the tropical Pacific Ocean. Over the period May 1971 through April 1973, monthly frequencies of highly reflective clouds were statistically tested for a regression relationship with 820 station-months of coral island rainfall. The correlation coefficient was +0.75 while the line of regression passed near the origin and was equidistant from the abscissa and ordinate. The F calculated from an analysis of variance table was highly significant at the 1% level. The rainfall estimated from highly reflective cloud frequencies was then compared to other tropical Pacific Ocean climatological rainfall estimates. (Sims-ISWS)
W77-02484

THE HAILPAD CALIBRATION FOR ITALIAN HAIL DAMAGE DOCUMENTATION,
Ufficio Centrale di Ecologia Agragia e difesa delle Piante coltivate dalle Avversita Meteoriche, Rome (Italy).
D. Vento.
Journal of Applied Meteorology, Vol. 15, No. 9, p 1018-1022, September 1976. 4 fig, 3 tab, 10 ref.

Descriptors: *Hail, *Measurement, *Equipment, *Calibrations, Sampling, Precipitation(Atmospheric), Instrumentation, Agriculture, Hazards, Damages, Foreign countries, Meteorology.
Identifiers: *Hailpads, *Hailpad calibration, *Italy.

After a synthesis of the characteristics of the hailpad used by the Central Office of Agrarian Ecology, Italy, the calibration method was described, including the formula, data, and necessary techniques, together with the tables and more significant graphs. The method by which the energy index of a hailstorm is evaluated was also specified. (Sims-ISWS)
W77-02486

MOLECULAR STUDIES OF THE ICE-FORMING CAPABILITIES OF DIFFERENT SURFACES,
Gidrometeorologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 3B.
W77-02487

THE SURVIVAL OF ICE PARTICLES FALLING FROM CIRRUS CLOUDS IN SUBSATURATED AIR,
California Univ., Los Angeles. Dept. of Meteorology.
W. D. Hall, and H. R. Pruppacher.
Journal of the Atmospheric Sciences, Vol. 33, No. 10, p 1995-2006, October 1976. 9 fig, 4 tab, 45 ref, 1 append. NSF DES75-09999.

Descriptors: *Ice, *Cloud physics, *Model studies, Clouds, Crystals, Particle shape, Sublimation, Evaporation, Equations, Mathematical models, Temperature, Air temperature, Humidity, Moisture, Meteorology.
Identifiers: *Cirrus clouds, Ice particles.

A theoretical study was carried out to determine the relevant microphysical processes which control the survival distance of ice particles falling from cirrus clouds in subsaturated air and to determine the atmospheric conditions which are necessary for such particles to 'seed' lower level supercooled clouds and thereby initiate glaciation. Differential equations were developed which describe the heat and mass transfer during the evaporation of cirrus ice particles. In these equations, forced convection and kinetic effects were included. Spherical, columnar, and plate-like ice particles were considered. The effect of radiative heat exchange between an ice particle and its environment was studied in terms of maximum and minimum physical limits for the upward and downward radiation fluxes. Using these limits and the known emission and absorption properties of ice, it was concluded that radiative heat transfer changes the survival distance of columnar ice crystals falling from cirrus clouds by less than 10% if the relative humidity of the environmental air is less than 70%. Considering the radiative effects and a wide range of values for the initial size and ice particle bulk density and for the temperature and humidity conditions of the ambient air, the present theoretical model showed that ice particles could survive distances of up to 2 km when the relative humidity with respect to ice was below 70% in a typical mid-latitude atmosphere. Larger survival distances are possible only if the ambient air has relative humidities larger than 70%. The theoretical model was compared to several field observations on evaporating cirrus ice particles. Good agreement was found with observational data when the atmospheric temperature and humidity profiles were available for the site at which the ice particles were sampled. (Sims-ISWS)
W77-02488

EVOLUTION OF RAINDROP SPECTRA WITH COLLISION-INDUCED BREAKUP,
Toronto Univ. (Ontario). Dept. of Physics.
R. List, and J. R. Gillespie.
Journal of the Atmospheric Sciences, Vol. 33, No. 10, p 2007-2013, October 1976. 3 fig, 23 ref.

Descriptors: *Raindrops, *Cloud physics, *Model studies, Mathematical models, Distribution, Particle size, Precipitation(Atmospheric), Laboratory tests, Coalescence, Rain, Equations, Meteorology.
Identifiers: *Raindrop breakup, Raindrop spectra, Drop collisions, Raindrop size, Rain processes.

A numerical model was set up to study the evolution of raindrop spectra by collision-induced breakup as measured in the laboratory. The main conclusion was that drops with diameters larger than 2-3 mm, falling in a population of smaller drops typical of natural rain, break up in comparatively short times (1-5 min in rainfalls of 100 mm/h). The presence of large drops (4-6 mm) in (cold) rain produced by the Wegener-Bergeron-Findeisen mechanism through melting of ice particles can be attributed to the short time available for large drops to break up in sufficient numbers during the time of fall after melting. Large drops are scarce in (steady-state) warm rain because they break up in collisions and rarely reach diameters larger than 2.5 mm. Hence, the standard notion of a critical diameter of 5-6 mm which raindrops are supposed to reach before breakup due to aerodynamic instability is no longer acceptable. (Sims-ISWS)
W77-02489

USE OF THE LANDSAT-2 DATA COLLECTION SYSTEM IN THE COLORADO RIVER BASIN WEATHER MODIFICATION PROGRAM,
Bureau of Reclamation, Denver, Colo. Div. of Atmospheric Water Resources Management.
A. M. Kahan.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-16525, Price codes: A02 in paper copy, A01 in microfiche. Report NASA-CR-146035, March 31, 1975. 11 p, 2 fig, 2 tab. NASA LANDSAT Inv. No. 23030.

Descriptors: *Remote sensing, *Equipment, *Instrumentation, Precipitation(Atmospheric), *Weather modification, Snow cover, Water resources, Water temperature, Winds, Weather data, Data collections, Hydrologic data.
Identifiers: *LANDSAT, *Data collection platforms, Satellite data collection systems.

This report described the progress made during the initial quarter of the Bureau of Reclamation's LANDSAT follow-on investigation. This investigation was conducted within the Bureau's Colorado River Basin Weather Modification Program, with primary emphasis away from the demonstration and testing of the LANDSAT Data Collection System toward its use as an operational tool in monitoring weather conditions for cloud seeding control. Five LANDSAT Data Collection Platforms were operated during the reporting period and proved to be reliable weather resistant units suitable for the collection of hydrometeorological data from remote, severe winter environments. The data relayed by LANDSAT satellite were available in near real-time for project forecasting. A significant accomplishment toward improving the LANDSAT DCS was the development of a system for averaging wind speed and wind direction data and on-site storage of hourly averaged data. (Sims-ISWS)
W77-02500

USE OF RADAR INFORMATION IN DETERMINING FLASH FLOOD POTENTIAL,
National Weather Service, Garden City, N. Y. Eastern Region.
S. E. Wasserman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 071, Price codes: A02 in paper copy, A01 in microfiche. Technical Memorandum NWS ER-60, December 1975. 10 p, 3 tab, 4 ref.

Descriptors: *Flash floods, *Flood forecasting, *Warning systems, *Radar, Rainfall, Floods, Remote sensing, Precipitation(Atmospheric), Rates, *Excessive precipitation, Measurement, Weather, Runoff, Meteorology, Hydrology.
Identifiers: *Weather radar.

An improved method was designed for the use of radar information by operational people in the flash flood program. Radar estimates of maximum precipitation were compared objectively with the minimum, three-hour precipitation amounts required for flash flooding. Through this comparison, areas that have a potential for flash flooding were determined. Information concerning the minimum rainfall required for flash flooding, called Flash Flood Guidance, was prepared and disseminated daily by River Forecast Centers. (Sims-ISWS)
W77-02509

2C. Snow, Ice, and Frost

ARIZONA'S FROZEN ASSETS: SNOWPACK MANAGEMENT,
Arizona Univ., Tucson. School of Renewable Natural Resources.
D. B. Thorud, and P. F. Ffolliott.
In: 19th Annual Arizona Watershed Symposium Proceedings, Report No. 7, p 31-34, Sept. 1975. 17 ref. OWRT A-045-ARIZ(6).

Descriptors: *Snowpacks, *Snow management, *Arizona, *Melt water, *Forest management, *Surface runoff, Water yield, Water yield improvement, Canopy.
Identifiers: *Runoff efficiency.

Reviews are presented of various snow research projects in Arizona over the past decade to demonstrate possibilities for enhancing snowmelt water yield, especially from forested watersheds. Between 1 1/4 and 2 1/2 million acre-feet of water can be in storage as snowpacks just before snowmelt runoff in early spring; a 10% increase in snowmelt water yields would mean an additional 125,000 to 250,000 acre-feet of water in the state. Research indicates that forest management practices affect the snowpack and cause increased snowmelt runoff; thinning and clearing of forest overstories to increase snowmelt water yield can be made compatible with timber, forage and wildlife production as well as recreational use. Development of forest management guidelines is discussed. Several process and theoretical studies were conducted to determine the relationships between snowpack conditions and forest overstories. Runoff efficiency, defined as the portion of a snowpack which is converted into recoverable surface water, was studied in several watersheds. Efficiencies appear to vary from year to year; however, there is a general trend of low efficiency at the start of a melt season, higher toward the middle, and gradually lower efficiency toward the season's end. (See also W77-02104) (Jahns-Arizona)
W77-02106

ARIZONA'S FROZEN ASSETS: VOLUMETRIC FORECASTS FROM SNOWPACK,
Arizona Water Commission, Phoenix.
E. Kirdar.
19th Annual Arizona Watershed Symposium Proceedings, Report No. 7, p 37-38, Sept. 1975.

Descriptors: *Watershed management, *Arizona, *Snow management, *Snowpacks, *Volumetric analysis, Snowmelt, Runoff, Runoff forecasting, Water resources development, Project planning, Water yield.
Identifiers: *Salt River Valley(Arizona), *Salt River Project, *Volumetric forecasting.

Snowfall is the main form of precipitation from winter storms which account for some 75% of the mean annual runoff in the three major drainage basins of the Salt River Valley in Arizona. About 90% of the total watershed lies below 7000 feet, and snowfall here tends to melt rapidly. Large runoff volumes may result in relatively short periods of time, causing major flooding potential if reservoir storage is high. The aims of the Salt River Project include providing sufficient water for municipal, agricultural and other needs of the valley, insuring reservoir carry-over, maximizing hydroelectric generation during summer months when power demand is high, and minimizing required pumping. The formulation of a Project Reservoir Operating Plan is discussed and the Index Forecast Method of predicting seasonal runoff outlined. Forecasting involves correlations of historical runoff with indices of important determinants of runoff for the area. Seasonal volumetric runoff forecasts are provided using bi-weekly snow survey information from mid-January to April 1. Other watershed information needed for management decisions is also discussed. (See also W77-02104) (Jahns-Arizona)
W77-02108

MEASUREMENTS OF THE TURBULENT BOUNDARY LAYER UNDER PACK ICE,
Washington Univ., Seattle. Dept of Geophysics.
M. G. McPhee, and J. D. Smith.
Journal of Physical Oceanography, Vol. 6, No. 5, p 696-711, September 1976. 17 fig, 7 tab, 23 ref. ONR N-00014-67-0103-0021, ONR N-00014-67-0103-0034.

Descriptors: *Boundary layers, *Turbulence, *Ice cover, Sea ice, Turbulent boundary layers, Model studies, Mathematical models, On-site investigations, Oceans, Currents(Water), Flow, Current meters, Measurement, Friction, Oceanography.

The mean and turbulent flow structure under pack ice was measured during the 1972 AIDJEX pilot study with small mechanical current meter triplets at eight levels in the planetary boundary layer. CTD profiles showed a well-mixed layer of nearly neutral stability to about 35 m, bounded below by a strong pycnocline. The skin friction velocity u* was determined by measuring the Reynolds stress at 2 and 4 m below the ice (beyond the surface layer) and from consideration of other terms in the mean momentum equation. Local pressure gradients and advective acceleration due to topography could not be ignored; when an estimate of the effect was included, u* was 1.0 + or - 0.1 cm/s when the ice velocity relative to the ocean was 24 cm/s. With the proper coordinate transformation, the planetary boundary layer of the ocean resembles that of the atmosphere. Composite averages of non-dimensional Reynolds stress and mean flow in the ocean, when compared with recent models of a neutrally buoyant, horizontally homogeneous atmosphere, fit the model predictions fairly well. However, the lateral component (perpendicular to surface stress) departed markedly from those predictions, indicating that form drag associated with pressure ridge keels is important. Peaks in spectra of vertical velocity were used to estimate eddy viscosity proportional to mixing length at eight levels in the outer layer. Results agreed well with the models, but this eddy viscosity did not provide a simple relation between Reynolds stress and mean flow shear. (Sims-ISWS)
W77-02138

KAISER EFFECT IN SNOW,
Montana State Univ., Bozeman.
C. C. Bradley, and W. St. Lawrence.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A022 528, Price codes: A02 in paper copy, A01 in

microfiche. Report ARO 11042.4-EN, 1975. Reprint from the Proceedings of the Grindelwald Symposium on Snow Mechanics held April 1974. IAHS-AISH publication No. 114, p 145-154, 1975. 5 fig, 3 ref. Army DA-ARO-D-31-124-73-G175.

Descriptors: *Snow, *Stress, *Sounds, Laboratory tests, Physical properties, Tension, Pressure, Loads(Forces), Graphical analysis, Mechanics.
Identifiers: *Kaiser effect(Snow).

Acoustical signals emanating from stressed snow indicated that snow, in common with other crystalline materials, exhibits Kaiser effect or 'memory' of previous stress. This memory can be quite specific as to the magnitude of the prestress. It also appears to be usable for identifying the mode of the prestress (compressive or tensile). These conclusions were drawn from laboratory experiments in which dimensioned snow columns were subjected to uniaxial dead loads both in compression and in tension, and then restressed after relaxation periods. Experiments on the longevity of the memory function indicated that most of the decay takes place in the first 6 h, but that it is still detectable after relaxation periods of up to 24 h. (Sims-ISWS)
W77-02154

LOCK WALL DEICING WITH WATER JETS: FIELD TESTS AT SHIP LOCKS IN MONTREAL, CANADA AND SAULT STE. MARIE, MICHIGAN,
National Research Council of Canada, Ottawa (Ontario). Div. of Mechanical Engineering; and National Research Council of Canada, Ottawa (Ontario). Gas Dynamics Lab.
For primary bibliographic entry see Field 8C.
W77-02156

ECOLOGICAL IMPACTS OF SNOWPACK AUGMENTATION IN THE SAN JUAN MOUNTAINS OF COLORADO.
Colorado State Univ., Fort Collins. Coll. of Forestry and Natural Resources.
For primary bibliographic entry see Field 3B.
W77-02160

WATER FLOW IN GLACIERS: JOKULHLAUPS, TUNNELS AND VEINS,
Bristol Univ. (England). H. H. Wills Physics Lab.
J. F. Nye.
Journal of Glaciology, Vol. 17, No. 76, p 181-207, 1976. 13 fig, 1 tab, 25 ref, 3 append.

Descriptors: *Glaciers, *Melt water, *Lakes, *Blowouts, Flow, Water, Tunnels, Glaciology, Ice, Theoretical analysis, Thermodynamic behavior, Heat transfer, Floods, Melting, Equations.
Identifiers: *Iceland, *Lake Grimsvotn, Ice-dammed lake, *Jokulhlaups.

The physics of water flow within and under glacier ice was examined with special reference to the periodic catastrophic outbursts of water (jokulhlaups) from the subglacial lake Grimsvotn, Vatnajokull, Iceland. The lake is sealed until it reaches a critical level which enables it to lift the glacier helped by a hydrostatic cantilever effect. The differential equations for non-steady water flow in a subglacial tunnel were derived and applied to the 1972 Grimsvotn outburst. The discharge time relation observed during the growth stage and the abrupt ending of the flood were both very well accounted for by a theory which is insensitive to the details of the subglacial tunnel system. The steady state, in which an intergranular vein or tunnel is simultaneously melted open by frictional heat and closed by plastic deformation, may be stable or unstable according to the conditions imposed at the ends. This explains why the flow of water in a vein does not normally increase unstably as in a jokulhlaup. An ice-dammed lake does not drain away through the vein system because the driving force on the vein-water is towards the lake rather than away from it. (Humphreys-ISWS)
W77-02458

THE EFFECT OF SUBGLACIAL CHEMICAL PROCESSES ON GLACIER SLIDING,
California Univ., Los Angeles. Dept. of Geology.
B. Hallet.
Journal of Glaciology, Vol. 17, No. 76, p 209-221, 1976. 4 fig, 17 ref, 1 append. NSF GA 40497X.

Descriptors: *Glaciers, *Ice, *Ice-water interfaces, Movement, Glaciology, Temperate, Subarctic, Theoretical analysis, Surfaces, Boundaries(Surfaces), Velocity, Equations, Freezing, Melting.
Identifiers: *Glacier sliding, Chemical processes, Chemical deposits.

The glacier sliding theory of Nye was modified to include the effect of solutes in subglacial regelation waters on the sliding process. Motivation for this development stems from studies of subglacially formed chemical deposits that appear to be widespread on rock surfaces recently exposed by retreating temperate glaciers. These deposits indicate clearly that considerable local concentration of solutes commonly occurs subglacially as a result of the selective rejection of solutes into the melt during the freezing associated with regelation sliding. Because solutes accumulate where regelation waters refreeze, they tend to lower the temperature there and, hence, inhibit the heat transport away from these areas which is essential for regelation sliding. For a simple sinusoidal bed and solute distribution in the regelation water film, the modified theory showed that a maximum excess of solutes of, for example, several millimoles/l of dissolved CaC03 along lee surfaces relative to stoss surfaces impedes basal sliding significantly, especially if the bed roughness wavelength does not exceed approximately one meter. (Humphreys-ISWS)
W77-02459

THE BEARING CAPACITY OF FLOATING ICE PLATES SUBJECTED TO STATIC OR QUASI-STATIC LOADS,
Princeton Univ., N. J. Dept. of Civil Engineering.
A. D. Kerr.
Journal of Glaciology, Vol. 17, No. 76, p 229-268, 1976. 28 fig, 3 tab, 153 ref.

Descriptors: *Reviews, *Ice, *Mechanical properties, *Strength of materials, Publications, Documentation, Ice loads, Loads(Forces), Ice cover, Elasticity(Mechanical), Plasticity, Shear, Bearing strength, Flexibility, Load distribution, Analytical techniques, On-site tests, Laboratory tests, Analysis, Equations, Bibliographies.
Identifiers: Floating ice plates.

This paper reported a critical survey of the literature on the bearing capacity of floating ice plates. The report consisted of a discussion of general questions, a critical survey of analytical attempts to determine the bearing capacity of floating ice plates, and a survey of field and laboratory tests on floating ice plates and their relation to the analytical results. It concluded with a systematic summary of the results, a discussion of observed shortcomings, and suggestions for needed investigations. (Humphreys-ISWS)
W77-02460

THE APPLICATION OF FRACTURE MECHANICS TO THE PROBLEM OF CREVASSE PENETRATION,
Cambridge Univ., (England). Dept. of Engineering.
R. A. Smith.
Journal of Glaciology, Vol. 17, No. 76, p 223-228, 1976. 4 fig, 7 ref.

Descriptors: *Glaciers, *Cracks, *Model studies, *Ice, Mathematical models, Theoretical analysis, Failure(Mechanics), Rupturing, Depth.
Identifiers: *Crevasses.

The elastic stress intensity factor is a paramter used in fracture mechanics to describe stress conditions in the vicinity of the tip of a sharp crack. By superimposing solutions of stress intensity factors for different loading conditions, equations were derived which model crevasses in ice. Solutions were presented for the theoretical depth of isolated crevasses, free from or partially filled with water. Close agreement existed with a previous calculation by Weertman using a different technique. The effect of crevasse spacing was investigated. It was demonstrated that closer spacing always reduces crevasse depth, but, over a wide range of spacing, the predicted variation in depth is slight. (Humphreys-ISWS) (See also W74-09335)
W77-02461

MEASUREMENTS OF ACOUSTIC PROPERTIES OF HARD-PACK SNOW,
Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
T. E. Lang.
Journal of Glaciology, Vol. 17, No. 76, p 269-276, 1976. 8 fig, 1 tab, 5 ref. NSF GA-3943, DA-ARO-D-31-124-71-G59.

Descriptors: *Snowpacks, *Acoustics, *Sound waves, Snow, Physical properties, *Measurement, On-site tests, Laboratory tests, Equipment, Analysis, Frequency.

Three experiments were conducted to assess acoustic properties of hard-pack snow. One test involved transmission of acoustic signals in the frequency range 100-20,000 Hz through natural snowpack in order to measure signal loss of a point acoustic source. It was found that at all frequencies, the relatively high-energy input signal decays rapidly by energy dissipation, with nominal dissusion occurring at large distances from the source. Signal persistence is greatest in the frequency range 100-200 Hz. In a second test, acoustic bursts in snow columns under deformation were recorded. Spectrum analysis in the frequency range 500-14,000 Hz revealed dominance of signal amplitudes at frequencies between 1000 and 10,000 Hz. This dominance was attributed to the strong attenuation properties of snow and suggests the use of waveguide or collector techniques to monitor natural acoustic emissions in snowpack. In a third test, several waveguide geometries and materials were evaluated for their acoustic signal interception and transmission characteristics. In general, metallic waveguides show the least attenuation of the configurations tested. (Humphreys-ISWS)
W77-02462

SNOW PRESSURE ON RIGID OBSTACLES,
Washington Univ., Seattle. Geophysics Program.
D. McClung.
Journal of Glaciology, Vol. 17, No. 76, p 277-285, 1976. 8 fig, 8 ref.

Descriptors: *Snow, *Load distribution, *Physical properties, Pressure, Loads(Forces), Viscous flow, Movement, Analysis, Theoretical analysis, Dynamics, Drag, Deformation, Snowpacks.
Identifiers: Retaining structures.

A continuum mechanical formulation of snow pressure was given. The snow pressure against retaining structures on slopes was considered in two separate parts: (1) the static component due to the regression of transverse expansion, and (2) the dynamic component due to the interruption of the creep (internal deformation) and glide (slip of the entire snow cover over the ground). Snow pressure calculations made using non-linear viscous constitutive equations were given for the plane

strain-rate problem of a rigid barrier on a snow-covered slope. These calculations were compared with the previous formulation of snow pressure given by Haefeli for the expected range of boundary conditions for the structure and for the snow-earth interface. The results showed that the original formulation by Haefeli gives a dynamic component of similar magnitude to the present calculations. Substantial differences were apparent when the up-slope distances for interruption of the creep and glide processes were compared. Any slope geometry, barrier geometry, distribution of density, and distribution of ground roughness are easily incorporated into the calculations. (Humphreys-ISWS)
W77-02463

THE ORIGIN OF GLACIALLY FLUTED SURFACES - OBSERVATIONS AND THEORY,
University of East Anglia, Norwich (England). School of Environmental Sciences.
G. S. Boulton.
Journal of Glaciology, Vol. 17, No. 76, p 287-309, 1976. 18 fig, 17 ref.

Descriptors: *Glaciology, *Geomorphology, *On-site investigations, Ice, Movement, Till, Glaciers, Cirques, Topography, Shape, Theoretical analysis, Boulders.
Identifiers: *Alps, *Flutes, *Iceland, *Spitsbergen, *Norway, Subglacial, Flute formation.

Studies of fluted surfaces beyond the margins of glaciers in Spitsbergen, Iceland, Norway, and the Alps show that almost all fluted surfaces emanate from rigid obstructions, commonly boulders in till. Field relations of flutes were described, and it was shown that a relationship exists between flute height and the height of the initiating obstruction. Subglacial observations indicated that flutes form when till is intruded into tunnels which tend to open up in the lee of obstacles. The pattern of strain implied by this process was shown to be reflected by micro- and macro-fabrics in the till. The commonly found occurrence of an average spacing between flutes does not arise because of some rhythmic or periodic mechanism in the glacier but is produced by the random seeding of boulders which themselves generate flutes. It was suggested that the term 'flute' be used as a genetic rather than a descriptive term and be restricted to long parallel-sided ridges which reflect accurately the direction of ice movement and which form when deformable subglacial materials are intruded into tunnels which tend to open up on the lee sides of single rigid obstructions on the glacier bed. (Humphreys-ISWS)
W77-02465

A THEORETICAL ANALYSIS OF THE FORMATION OF GLACIAL FLUTES,
University of East Anglia, Norwich (England). School of Environmental Sciences.
E. M. Morris, and L. W. Morland.
Journal of Glaciology, Vol. 17, No. 76, p 311-323, 1976. 5 fig, 1 tab, 20 ref.

Descriptors: *Glaciology, *Geomorphology, *Ice, Movement, Till, Glaciers, Cirques, Theoretical analysis, Topography, Shape, Equations, Mathematical studies, Glacial sediments.
Identifiers: *Flutes, *Iceland, *Flute formation.

In an analysis of the formation of flutes by subglacial cavities, the flute-forming sediment was treated as a linear isotropic elastic material prior to failure, which occurs when Coulomb's law is satisfied. The maximum height of a flute was derived as a function of the mechanical properties of its material, and the factors controlling the variation of height with distance along the flute were analyzed. The flow pattern of material during the formation of a flute which the theory suggests was similar to the patterns which have been determined in a till fabric analysis of flutes near Breioamerkurjokull, Iceland. (Humphreys-ISWS)
W77-02466

CLIMATIC INFERENCES FROM FORMER GLACIERS IN THE SOUTH-EAST GRAMPIAN HIGHLANDS, SCOTLAND,
Edinburgh Univ., (Scotland). Dept. of Geography.
J. B. Sissons, and D. G. Sutherland.
Journal of Glaciology, Vol. 17, No. 76, p 325-346, 1976. 4 fig, 7 tab, 34 ref.

Descriptors: *Glaciers, *Climatology, *Precipitation(Atmospheric), Firn, Glaciation, Ablation, Albedo, Glaciology, Geomorphology, Snow, Snowfall, Temperature, Solar radiation, Quaternary period, Climatic data, Analysis, Foreign countries.
Identifiers: *Scotland, *Younger Dryas.

Altitudes, lengths, areas, maximum thicknesses, and volumes of 27 glaciers that built up in a small area of the Scottish Highlands during the Loch Lomond (Younger Dryas) stadial were given. The influence of direct radiation on the glaciers was calculated taking into account transmissivity of the atmosphere, glacier aspect and surface gradient, and the albedos of ice and snow. Equilibrium firn lines for the glaciers were determined. The computed regional firn line, incorporating the influence of direct radiation, had a gradient of 14.5 m/km. Former precipitation values were based on an equation for average annual mass balances of the glaciers during the stadial that incorporates glacier altitude, regional ablation gradient, direct radiation, the influence of avalanching and blowing of snow, and final glacier volume. Average July and January sea-level temperatures of 6C and at least -8C, respectively, were inferred. Snowfall was principally associated with south-east winds and was similar in total to present day but rather differently distributed. Cloud amounts, at least in summer, were greater than now. A more vigorous atmospheric circulation with many depressions moving along more southerly tracks than now may have been related to the junction of polar water and North Atlantic Drift water in the immediate vicinity of the British Isles. (Humphreys-ISWS)
W77-02467

AUTOMATED SEISMIC MONITORING SYSTEM FOR LAKE MICHIGAN ICE STUDIES,
Wisconsin Univ., Milwaukee. Dept. of Geological Sciences.
R. W. Taylor, J. P. Kovach, and N. P. Lasca.
Journal of Glaciology, Vol. 17, No. 76, p 347-350, 1976. 2 fig, 1 ref. NSF KG-41011.

Descriptors: *Lake ice, *Lake Michigan, *Data processing, *Seismic properties, Seismic waves, Instrumentation, Ice, Data storage and retrieval, Monitoring, Basic data collections, Automation.

A simple, relatively inexpensive system for signal recovery in retrospect was designed to record lake-ice seismic events. The system is broad-band, D.C. to 100 Hz, light-weight and may be added to any existing data-acquisition equipment. The system may be used (1) to initiate high speed paper recordings in the field, (2) to store transient events on magnetic tape while in the field, or (3) for the unattended laboratory-recovery of transient events from a continuous field recording. Continuous, high resolution, broad-band recordings of seismic events occurring in lake ice over a period of weeks may be stored on a single reel of magnetic tape. The initial cost of the device is rapidly equaled by the savings in tape cost and man hours expended in signal recovery. (Humphreys-ISWS)
W77-02468

A NOTE ON THE CONTRIBUTION OF RIME AND SURFACE HOAR TO THE ACCUMULATION ON THE ROSS ICE SHELF, ANTARCTICA,
Nevada Univ., Reno. Desert Research Inst.
G. O. Linkletter, and J. A. Warburton.
Journal of Glaciology, Vol. 17, No. 76, p 351-354, 1976. 1 fig, 1 tab, 14 ref. NSF OPP73-05843-A01.

Descriptors: *Antarctic, *Ice, *On-site investigations, *Fog, Frost, Snow, Snow packs, Snow surveys, Rime, Surfaces.
Identifiers: *Ross Ice Shelf.

Observations and measurements made on the Ross Ice Shelf during 1974 suggested that rime and surface hoar deposited on the surface during fogs may contribute 5-10% of the annual accumulation. Layers formed during such fogs may be mistaken for depth hoar layers in the snow-pack. (Humphreys-ISWS)
W77-02469

A CONCISE METHOD FOR ANALYZING THE ICE-MELTING PERFORMANCE OF A HEATED DISC,
Sun Oil Co., Richardson, Tex. Science and Technology Div.
J. F. Lea.
Journal of Glaciology, Vol. 17, No. 76, p 355-358, 1976. 1 fig, 2 ref.

Descriptors: *Ice, *Melting, *Mathematical studies, Heat transfer, Temperature, Theoretical analysis, Equations, Analytical techniques, Mathematics, Numerical analysis.
Identifiers: *Heated disc.

Shreve (1962) evaluated the performance of solid-nose hotpoints of various geometries. A more concise method for analysis of the special case of a flat disc melting into ice was presented. In contrast to the numerical solution presented by Shreve, this method resulted in a closed analytical solution, based on constant properties, which is corrected using a property ratio scheme. This technique allowed the substitution of various fluid properties into the solutions as might be required when considering contaminated or saline ice or other liquids. Shreve's method would require some additional numerical work to evaluate various properties because the temperature dependence of the viscosity of water is integrated into the results. Results obtained for the flat disc using this method were shown to compare favorably with Shreve's indicating that this type of analysis may be applicable to other meltunit geometries. (Humphreys-ISWS)
W77-02470

ICE MOVEMENT AND DISTRIBUTION IN THE BERING SEA FROM MARCH TO JUNE 1974,
Alaska Univ., College. Inst. of Marine Science.
R. D. Muench, and K. Ahlnas.
Journal of Geophysical Research, Vol. 81, No. 24, p 4467-4476, August 20, 1976. 12 fig, 1 tab, 14 ref. NOAA 5-35190.

Descriptors: *Sea ice, *Ice cover, Movement, *Distribution, Winds, Surveys, Remote sensing, Satellites(Artificial), Distribution patterns, Heat transfer, Ice, Circulation, Water circulation, Oceanography.
Identifiers: *Bering Sea, *Ice movement.

Ice distribution and motion in the Bering Sea from March to June 1974 were observed by imagery from the NOAA 2 and 3 VHRR (very high resolution radiometer) satellites. The southerly ice edge was nearly constant in position from Marsch to mid-May, when ice disintegration had progressed to a point where the edge was undefined. Ice movement was southerly in response to northerly winds until late April, after which variable ice motion reflected variable winds. The southerly motion created regions of ice divergence south of islands and along east-west trending southern coasts. In some areas such as the Bering Strait, water motion exerted sufficient stress on the ice to balance the wind stress, resulting in stationary ice of northerly ice motion. The Bering Sea ice cover is conceptualized as northern source and southern

sink regions connected by an intermediate zone of southerly ice motion. A mean observed southerly ice motion of 18 cm/s requires heat losses for ice formation of the order of 10 g-cal/sq m/s or an order of magnitude greater if most ice is assumed to form in divergent areas covered by thin ice or that have open water. These values are in agreement with previous estimates of sea-air heat flux in the Arctic. (Sims-ISWS)
W77-02482

AN OPERATIONAL APPLICATION OF SATELLITE SNOW COVER OBSERVATIONS - NORTHWEST UNITED STATES,
Bonneville Power Administration, Portland, Oreg.
J. P. Dillard.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-16599, Price Codes: A02 in paper copy, A01 in microfiche. Report NASA CR-144723, November 1975. 32 p, 2 fig, 3 tab, 3 ref, 1 append. NASA S-53877.

Descriptors: *Remote sensing, *Snow cover, *Pacific northwest U.S., *Satellites(Artificial), Surveys, Mapping, Water resources, Snow, Precipitation(Atmospheric), Snowmelt, Runoff, Snow surveys, Aircraft, Watersheds(Basins), Rivers, Water levels, Hydroelectric power, Powerplants.
Identifiers: *LANDSAT.

LANDSAT-1 imagery showing extent of snow cover was collected for the 1973 and 1974 snowmelt seasons for the following Columbia River Basins: North Santiam River Basin above Detroit Dam, Oregon; Upper Snake River Basin above Palisades Dam, Idaho; and Boise River Basin above Lucky Peak Dam, Idaho. The primary objective of this study was to map snowlines and determine the aerial snow cover using satellite data. A secondary objective was to compare satellite snow mapping products to products from conventional information sources. A long-term objective was to develop or to modify methods in an operational mode to incorporate satellite-derived snow cover data to improve runoff forecasting techniques. Available satellite data were successfully analyzed by radiance thresholding to determine snowlines and the attendant snow-covered area. Conventional data sources were used to verify the data obtained from satellite imagery. A computer model capable of reconstituting streamflow was one such source used for this verification. Verification of the LANDSAT-1 data was generally good, although there were exceptions. Two major problems were (1) a lack of adequate cloud-free satellite imagery of high resolution, and (2) need for a way to determine snowlines in forested areas. (Sims-ISWS)
W77-02496

2D. Evaporation and Transpiration

OPTIMIZATION OF WATER USE EFFICIENCY UNDER HIGH FREQUENCY IRRIGATION--I. EVAPOTRANSPIRATION AND YIELD RELATIONSHIP,
New Mexico State Univ., University Park. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W77-02103

RELATIVE IMPORTANCE OF SOIL RESISTANCE AND PLANT RESISTANCE IN ROOT WATER ABSORPTION,
Agricultural Research Service, Florence, S. C. Southern Region.
D. C. Reicosky, and J. T. Ritchie.
Soil Science Society of America Journal, Vol. 40, No. 2, p 293-297, March-April, 1976. 3 fig, 1 tab, 32 ref.

Descriptors: *Soil-water-plant relationships, *Moisture uptake, *Soil water, *Transpiration, Water loss, Leaves, Corn, Sorghum, Nutrients, Root zone, Absorption, Sands, Soil types, Clays, Hydraulic conductivity.

The relative importance of soil and plant resistances and their influence on leaf water potential and transpiration over a range of measured hydraulic conductivities and matric potentials commonly encountered in Varina sandy loam and Houston Black Clay was evaluated. Experiments were conducted on corn grown in a greenhouse and sorghum grown in a field. Soil water potentials, leaf water potentials, and transpiration rates were determined to evaluate the magnitude of the combined soil and plant resistances to water flow in the plant system. Results show that when root density was not unusually low, plant resistance to water transport was much larger than soil resistance until a higher threshold soil hydraulic conductivity was reached. These findings emphasize the need to consider plant resistance in moisture uptake calculations when using equations that evaluate water potential gradients along the water flow path. (Jamail-Arizona)
W77-02118

EFFECT OF ABSCISIC ACID AT DIFFERENT LEVELS OF SOIL WATER POTENTIAL ON THE TRANSPIRATION OF ZEA MAYS,
Aarhus Univ. (Denmark). Inst. of Plant Physiology.
For primary bibliographic entry see Field 3B.
W77-02121

WATER FLOW IN WHEAT SEEDLINGS AFTER SMALL WATER DEFICITS,
Lund Univ. (Sweden). Dept. of Plant Physiology.
A. Nordin.
Physiologia Plantarum, Vol. 37, No. 2, p 157-162, 1976. 7 fig, 2 tab, 19 ref.

Descriptors: *Moisture stress, *Moisture uptake, *Moisture deficit, *Moisture content, *Moisture availability, Root zone, Root systems, Stress, Wheat, Transpiration, Hygrometry, Moisture meters, Leaves, Stomata, Conductivity, Ion transport, Water balance.

The after-effects of slightly increased leaf water deficits on water flow through wheat seedlings are discussed. Transpiration and water uptake were measured simultaneously using a micro-wave hygrometer and a recording potometer. It is known that water deficits can be achieved by cooling the roots while the shoots are subject to conditions for high transpiration rate. An experiment was conducted to find out if root cooling without accompanying leaf stress, will induce changes in water flow. Wheat seedlings were kept with the roots at one degree centrigrade in nutrient solution and the shoots in air at 20 degrees centigrade for 24 hours. This treatment induced a 2 percent decrease in relative water content of the leaves which rapidly disappeared after a return to normal root temperatures. The magnitude of the after-effects varied with leaf water content, though some contribution of root cooling to the after-effects cannot be excluded. The decreased water flow through the plant after removal of stress can be attributed mainly to increased stomatal resistance and not to effects on root conductivity. The increased stomatal resistance appears linked to increased membrane permeability rather than to a decrease in the active mechanism for ion uptake. (Jamail-Arizona)
W77-02172

SENSITIVITY AND MODEL VARIANCE ANALYSIS APPLIED TO SOME EVAPORATION AND EVAPORTRANSPIRATION MODELS,
Agricultural Research Service, Chickasha, Okla.
G. Coleman, and D. G. DeCoursey.
Water Resources Research, Vol. 12, No. 5, p 873-879, October 1976. 2 fig, 2 tab, 16 ref.

Descriptors: *Analytical techniques, *Mathematical models, Forecasting, *Evaporation, *Evapotranspiration, Model studies.
Identifiers: *Sensitivity analysis, *Error variance analysis, Finite difference.

Variable sensitivity and error variance of six evaporation and evapotranspiration models were calculated. Their sensitivity values were computed by approximating the partial derivatives by finite differences. To compare the models, relative sensitivity was computed as the percent change in evaporation per unit change in the input variable. A second relative sensitivity was calculated to compare the relative importance of the different input variables. Error variance was analyzed to find the variance of error due to instrument inaccuracies using instrument variance estimated from the manufacturer's statements. Although no tests were conducted to determine the bias or prediction accuracy of the model, a technique was proposed to show how the instrument error variance could be added to the prediction error variance to determine the overall system variance. In model development the best model will be one whose sum of these two variances is a minimum if there is no prediction bias.
W77-02298

PATTERNS OF LEAF RESISTANCE TO LODGEPOLE PINE TRANSPIRATION IN WYOMING,
Wyoming Univ., Laramie. Dept. of Botany.
N. Fetcher.
Ecology, Vol. 57, No. 2, p 339-345, Early Spring 1976, 4 fig, 27 ref. OWRT A-011-WYO(1). 14-31-0001-3551, 3851, 4051, 5051.

Descriptors: *Conifers, *Stomata, *Transpiration, *Lodgepole pine trees, *Wyoming.
Identifiers: *Leaf resistance, Mountain watersheds, Stomatal behavior, Water potential.

Leaf resistance of lodgepole pine was measured with an aspirated porometer at three sites in the Medicine Bow Mountains, Wyoming. In the early part of the growing season all the sites had low leaf resistance (3-5 s/cm) and few significant changes in leaf resistance during the day. Towards the end of the growing season, in August, significant increases in midday leaf resistance occurred at all sites. The greatest increase (to 57 s/cm) was found on the driest site. Smaller increases (to 10-14 s/cm) were measured at a dry-mesic site and a mesic site. The results indicate that stomatal control of transpiration is more important towards the end of the growing season and that the degree of control varies with the soil water regime of the site. The response to soil water status appears to be nonlinear. When base pressure potential readings were above an upper threshold, leaf resistance did not increase during the day. Below a lower threshold it increased significantly. Between the two thresholds, changes in leaf resistance under high light conditions are explained more readily by the interaction between vapor pressure deficit and soil water status than by either factor alone.
W77-02531

DRIP IRRIGATION INCREASES YIELD AND SIZE OF 'SUNRICH' NECTARINES,
Florida Univ., Gainesville. Dept. of Fruit Crops.
For primary bibliographic entry see Field 3F.
W77-02541

EVAPOTRANSPIRATION MODEL TESTED FOR SOYBEAN AND SORGHUM,
Kansas State Univ., Manhattan. Dept. of Agronomy.
E. T. Kanemasu, L. R. Stone, and W. L. Powers.
Agronomy JOurnal, Vol. 68, No. 4, p 569-572, July-August 1976. 3 fig, 3 tab, 13 ref. OWRT A-056-KAN(3).

Descriptors: *Evapotranspiration, *Sorghum, *Soybeans, *Model studies, Evaporation, Transpiration, Advection, Stomata, Lysimeters, Temperature, Soil moisture, Soil water movement, Solar radiation.
Identifiers: Stomatal resistance, Leaf area index.

Daily evapotranspiration estimated using a new model applied to sorghum and soybeans was within 2 mm of estimates by lysimetric observation. The model employs daily inputs of temperature, solar radiation and leaf area index; outputs include transpiration and evaporation. The model has potential in scheduling irrigation on a routine basis. Seasonal evaporation accounted for 15 to 20% of the evapotranspiration which was about 10% greater from soybeans than from sorghum. Nighttime evapotranspiration losses (lysimetric) from soybeans were also 1.8 times greater, indicating lower stomatal resistance. Leaf area indices indicated a greater surface resistance for sorghum. (Jahns-Arizona)
W77-02550

2E. Streamflow and Runoff

A MODEL FOR PREDICTING FLOOD HAZARDS DUE TO SPECIFIC LAND-USE PRACTICES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-02078

AN ANALYSIS OF THE EFFECTS OF PARAMETER UNCERTAINTY IN DETERMINISTIC HYDROLOGIC MODELS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2A.
W77-02125

GRID TURBULENCE IN HYDRAULIC MODELS,
Windsor Univ. (Ontario). Dept. of Engineering.
For primary bibliographic entry see Field 8B.
W77-02128

SYNTHETIC DESIGN HYETOGRAPH AND RATIONAL RUNOFF COEFFICIENT,
American Consulting Services, Inc., Minneapolis, Minn. Environmental Engineering.
J-S. Chien, and S. Sarikelle.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 102, No. IR3, Proceedings Paper 12375, p 307-315, September 1976. 3 fig, 3 tab, 11 ref, 2 append.

Descriptors: *Urban hydrology, *Hydrographs, *Hyetographs, *Rainfall intensity, Rational formula, Runoff coefficient, Urban runoff, Hydrology, Rainfall, Drainage, Time of concentration, Storms.
Identifiers: *Synthetic hyetograph, *Rational runoff coefficient, Average runoff coefficient.

A simple method of establishing the synthetic design hyetograph was presented. The method was based on rainfall intensity-duration-frequency curves with simple computation. The method incorporated the rainfall duration, rainfall depth, and the advancing storm patterns. In addition, a method of computing the average runoff coefficient for the Rational Method was developed. This method was predicated on the principle of mass conservation using Horner's field data. Examples were given for the establishment of synthetic design hyetograph and its application to the determination of average runoff coefficient. The methods presented were useful tools for drainage analysis. (Lee-ISWS)
W77-02135

FLOW RECESSION IN THE EPHEMERAL STREAM,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
R. W. Peebles.
Ph.D. Dissertation, 1975. 88 p, 13 fig, 4 tab, 11 ref.

Descriptors: *Streamflow, *Recession curves, *Ephemeral streams, *Hydraulic models, Model studies, Hydrographs, Discharge(Water), Stage-discharge relations, Streamflow forecasting, Equations, Continuity equation, Reservoir leakage, *Arizona.
Identifiers: *Walnut Gulch Experimental Watershed(Ariz), Pantano Wash(Ariz).

The flow recession portion of the ephemeral stream flood hydrograph is modeled as a conceptual analog of the discharge from a leaky reservoir. This model may be used where flow data is absent and as an operational tool. The reservoir approximates physically the portion of the ephemeral stream channel that is flowing at the start of recession. The reservoir model is described by a continuity equation, a discharge-stage relation (rating) and a storage-stage relation that conveys reservoir shape. A good agreement between observed and model curves is achieved by optimizing reservoir leakage rate and initial storage and is most sensitive to changes in initial storage. Streamflow records used in the study are from the Walnut Gulch Experimental Watershed and Pantano Wash, both in Arizona. The best parameter values are physically realistic; the best reservoir configuration has leakage that varies directly with stage (depth) and storage that varies as the square of the stage. Results suggest that a characteristic shape may exist for recession at a point on the stream. (Jahns-Arizona)
W77-02162

MAINE RIVERS BIBLIOGRAPHY- A USER'S MANUAL,
Research Inst. of the Gulf of Maine, Portland.
For primary bibliographic entry see Field 10C.
W77-02224

PROJECT DEVELOPMENT AND DATA PROGRAMS FOR ASSESSING THE QUALITY OF THE WILLAMETTE RIVER, OREGON,
Geological Survey, Portland, Oreg. Water Resources Div.
D. A. Rickert, W. G. Hines, and S. W. McKenzie.
Available from Branch of Distribution, USGS, 1200 S. Eads St., Arlington, Va., 22202. Circular 715-C, 1976. 31 p, 7 fig, 3 tab, 43 ref.

Descriptors: *Water quality, *Project planning, *Rivers, *Oregon, Evaluation, Methodology, Water quality control, Model studies, Land development, Environmental effects, Water pollution sources, Trace elements, Bottom sediments, Algae, Dissolved oxygen, Erosion.
Identifiers: *Willamette River(Oreg).

The U. S. Geological Survey recently (1976) completed an intensive river-quality assessment in the Willamette River basin, Oregon. This circular covers aspects of overall project development and methods and data programs used to assess four river-quality problems. The assessed problems were (1) the effect of population and industrial growth and resulting waste discharges on dissolved oxygen, (2) the potentially harmful effects on land and river quality of accelerated erosion resulting from intensified land use, (3) the potential for nuisance algal growths, and (4) the possibility of trace-metal accumulation in river-bottom sediments. Described are the approaches and rationales used to organize the project, to select and formulate the assessment methods, and to design the data programs. (Woodard-USGS)
W77-02301

SELECTION OF STREAMFLOW AND RESERVOIR-RELEASE MODELS FOR RIVER-QUALITY ASSESSMENT,
Geological Survey, Jackson, Miss.; and Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 2A.
W77-02302

EFFECTS OF WATER-MANAGEMENT PRACTICES ON THE FLOW OF THE SOUTH PLATTE RIVER, COLORADO,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-02303

SIMULATED EFFECTS OF THE PROPOSED TENNESSEE COLONY RESERVOIR ON GROUND-WATER CONDITIONS IN THE CARRIZO-WILCOX AQUIFER AND TRINITY RIVER ALLUVIUM, TEXAS,
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-02305

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 1. NORTH ATLANTIC SLOPE BASINS--VOLUME 3. BASINS FROM MARYLAND TO YORK RIVER.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-02307

TRANSVERSE MIXING IN NATURAL CHANNELS,
Geological Survey, Reston, Va. Water Resources Div.
N. Yoksukura, and W. W. Sayre.
Water Resources Research, Vol 12, No 4, p 695-704, August 1976. 8 fig, 25 ref.

Descriptors: *Diffusion, *Solutes, *Natural streams, *Steady flow, *Mathematical models, Forecasting, Water quality, Equations, Natural flow, Channel flow, *Mixing, Meanders, Evaluation, Data collections.
Identifiers: *Transverse mixing.

A mathematical model is presented for predicting the steady state two-dimensional distribution of solute concentration in a meandering nonuniform natural channel. Two features of the convection-diffusion (mixing) equation derived are that it employs the transverse cumulative discharge as an independent variable replacing the transverse distance and that it is developed in an orthogonal curvilinear (natural) coordinate system which follows the general direction of the channel flow. The transformed mixing equation unifies and generalizes essential concepts of several existing models which have been used successfully for simulating steady state transverse mixing in irregular natural channels. Solution methods, both analytical and numerical, and parameter estimation methods are presented. Results of simulation are compared with observed data. (Woodard-USGS)
W77-02313

COMPARISON OF LINEAR SYSTEMS AND FINITE DIFFERENCE FLOW-ROUTING TECHNIQUES,
Geological Survey, Jackson, Miss. Water Resources Div.
T. N. Keefer.
Water Resources Research, Vol 12, No 5, p 997-1006, October 1976. 10 fig, 13 ref.

Descriptors: *Streamflow forecasting, *Model studies, *Flow characteristics, Routing, *Finite element analysis, Evaluation, *Linear programming, Systems analysis.

Identifiers: Streamflow model comparison, *Finite difference method.

A single-input linear system model and a multiple-input linear system model are compared to a finite difference model. Comparisons are based on the ability of the models to predict discharge at the downstream end of a 24.14-km reach of prismatic channel. Four types of channels and two slopes covering a wide range of conditions are evaluated. The single-input model compares favorably in cases where flood wave celerity does not vary greatly with discharge. The multiple-input model can be made to compare favorably in all cases. Linear model parameters cannot be set accurately without calibration, except in the case of rectangular channels. The single-input model is approximately one sixth as costly as the finite difference model, and the multiple-input model is approximately one half as costly for the conditions investigated. (Woodard-USGS)
W77-02319

MARYLAND HIGHWAY DRAINAGE STUDY: VOLUME I - SUMMARY REPORT,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W77-02490

MARYLAND HIGHWAY DRAINAGE STUDY: VOLUME II - A COMPARISON OF MARYLAND HIGHWAY DRAINAGE PRACTICES WITH THOSE OF OTHER AGENCIES,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W77-02491

MARYLAND HIGHWAY DRAINAGE STUDY: VOLUME III - A LINKED SYSTEM MODEL FOR THE SYNTHESIS OF HYDROGRAPHS IN URBAN AREAS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W77-02492

MARYLAND HIGHWAY DRAINAGE STUDY: VOLUME VI - AN EXPERIMENTAL EXAMINATION OF THE SUBSURFACE DRAINAGE OF ROADWAYS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W77-02493

2F. Groundwater

GEOPHYSICAL STUDY OF THE WATERBEARING STRATA IN BITTERROOT VALLEY, MONTANA,
Montana Univ., Missoula. Dept of Geology.
G. W. Crosby.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 390, Price codes: A05 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center, Bozeman, Report No. 80, September 1976. 68 p, 23 fig, 3 tab, 52 ref. OWRT A-063-MONT(1). OWRT 14-31-0001-4026.

Descriptors: *Hydrogeology, *Groundwater resources, Magnetic studies, Seismic studies, *Subsurface mapping, *Montana, Model studies.
Identifiers: *Bitterroot Valley(Mont), *Bouguer anomaly, Ambrose Creek area(Mont).

A map of the complete Bouguer anomaly for the Bitterroot Valley in Western Montana is produced and interpreted to yield the general geometry of Cenozoic valley fill sediments. Various steps in processing the gravity data are discussed including lowpass, frequency domain filtering and two and three dimensional modeling. Refraction and reflection seismic data are analyzed for the area north of Stevensville to verify the models generated from the gravity data and to investigate the possibility of using seismic methods to gain meaningful data for ground water prospecting. A map of the total magnetic intensity is presented for the area north of Stevensville. Depth estimates based upon the magnetic data indicate anomalies originating from several levels in the subsurface in the vicinity of Ambrose Creek. Three dimensional modeling of the magnetic field verified the existence of a multilayer anomalous body. Results indicate the existence of a continuous surface which extends from the eastern face of the Bitterroot Range and intersects the anomalous magnetic body in the Ambrose Creek area. (Stuart-Montana State)
W77-02085

INVESTIGATION OF TWO-REGIME WELL FLOW,
University Coll. of Swansea (Wales).
For primary bibliographic entry see Field 4B.
W77-02142

NUMERICAL SOLUTION OF BOUSSINESQ EQUATION,
Punjab Agricultural University, Ludhiana (India), Dept. of Soil and Water Engineering.
S. R. Singh, and C. M. Jacob.
Journal of the Engineering Mechanics Division, American Society of Civil Engineers, Vol. 102, No. EM5, Proceedings Paper 12463, p 807-824, October 1976. 4 fig, 24 ref, 2 append.

Descriptors: *Aquifers, *Groundwater, *Mathematical models, *Numerical analysis, Water resources, Analytical techniques, Seepage, Hydrology, Equations, Model studies, Flow.
Identifiers: *Boussinesq equation, Travel waves, Crank-Nicolson finite difference scheme, Phreatic aquifer.

The Boussinesq equation is a mathematical model of unconfined groundwater flow. Since the equation is nonlinear, finite difference methods offer a possible technique for solutions. In this study, an extrapolated Crank-Nicolson finite difference scheme for one-dimensional Boussinesq equation with source and sink terms was described to model the flow through a phreatic aquifer lying between two open channels. Generalized traveling wave solutions of the same equation were also obtained. A comparison of the extrapolated Crank-Nicolson solution with a traveling wave solution confirmed the accuracy of the former. Details of the response of an unconfined aquifer subject to different rates of recharge and withdrawal were presented. (Lee-ISWS)
W77-02143

PREDICTION OF MOUND GEOMETRY UNDER RECHARGE BASINS,
San Jose State Univ., Calif.
R. Singh.
Water Resources Research, Vol. 12, No. 4, p 775-780, August 1976. 8 fig, 17 ref. NSF GK-18526.

Descriptors: *Groundwater recharge, *Unsteady flow, *Laplaces equation, Recharge, Mathematical studies, Water table, Porous media, Dimensional analysis, Analysis, Computers, Groundwater, Graphical analysis, Equations.
Identifiers: *Finite difference analysis, Boundary conditions.

Design of recharge facilities close to urban centers requires determination of the transient water table in the vicinity of the recharge site. This involves solution of the Laplace equation subject to appropriate boundary and initial conditions which are nonlinear and extremely complex for a phreatic surface with or without accretion. Previous solutions have been obtained either by linearization of the phreatic surface conditions or by utilization of other simplifying assumptions. These solutions are usually inapplicable in regions with steep hydraulic gradients. A technique for computing the transient location of the water table under finite width longitudinal and circular recharge basins was developed. The technique avoided limiting assumptions and linearization. The computations were carried out on a digital computer. Results were presented graphically and compared with other solutions where appropriate. (Adams-ISWS)
W77-02144

THE DETERMINATION OF SEASONAL VARIATIONS IN GROUNDWATER RECHARGE BY DEUTERIUM AND OXYGEN-18 ANALYSIS FOR THE TUCSON BASIN, ARIZONA,
Arizona Univ., Tucson. Dept. of Geosciences.
R. S. White.
Master of Science Thesis, 1976. 45 p, 10 fig, 4 tab, 40 ref, 2 append.

Descriptors: *Isotope studies, *Deuterium, *Groundwater recharge, *Water management(Applied), *Oxygen isotopes, Recharge, Aquifers, Seepage, Natural recharge, Subsurface waters, Water shortage, Precipitation(Atmospheric), Rainfall, *Arizona, Semiarid climates, Seasonal.
Identifiers: *Tucson Basin(Ariz).

A study was conducted to develop a method for determining the source of groundwater recharge in the Tucson Basin, in southern Arizona. Once these source areas have been defined, isotopic analysis of the water now in storage can help determine whether winter or summer precipitation is more important toward recharge, thus facilitating water management. Paths of recharge were traced by using oxygen-18 and deuterium. It was found that deuterium and oxygen-18 have a distinct differentiation between summer and winter sequences of rain, with the summer precipitation being enriched in deuterium and oxygen-18, due mostly to evaporation fractionation. This distinctive characteristic of the precipitation should help make the identification of recharge areas and recharge paths throughout the basin possible. (Jamail-Arizona)
W77-02169

HYDROGEOLOGIC CHARACTERISTICS OF THE MISSOURI RIVER VALLEY FLOOD PLAIN,
Missouri Univ., Columbia. Dept. of Geology.
J. M. Sharp, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 355. Price codes: A04 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, Columbia, Completion Report, October 1, 1976. 68 p, 25 fig, 2 tab, 21 ref. OWRT A-085-MO(1). 14-34-0001-6026.

Descriptors: *Missouri River, *Flood plains, *Alluvial aquifers, Mathematical models, Bank storage, *Hydrogeology, Groundwater, Model studies, Water levels.
Identifiers: Lower Missouri River Valley.

A combination study of field investigation, year-long monitoring of river stage and ground-water conditions, and mathematical modelling provides insights into the unexpected variability of flood plain hydrogeology. The ground-water system reflects a continum of change rather than variations from a steady-state condition. Factors controlling ground-water levels are: distance from the river, time since any change in river stage, the geometry of river meanders and valley walls, inhomogeneities in top stratum materials, position of tributary creeks and whether these creeks are influent or effluent, long-term ground-water level

near valley walls, and pumping. It was possible to separate the flood-plain study area into four types of ground-water response: areas of continuing ground-water high, areas of predominantly down valley flow, areas of slow ground-water response, and areas of rapidly fluctuating ground-water levels. River-ground water interactions were found to be predominantly effluent, predominantly influent, or alternating influent-effluent. Examination of field data cast serious doubts on the validity of common bank-storage model assumptions. Major alluvial aquifers are inhomogeneous and may be confined and/or unconfined. Furthermore, the Dupuit-Forcheimer conditions are not valid nor is the assumption of fully penetrating streams. The lower Missouri River Valley alluvium represents a major, but relatively little used aquifer.
W77-02194

DESCRIPTIONS AND CHEMICAL ANALYSES FOR SELECTED WELLS IN THE CENTRAL SACRAMENTO VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-02299

STATUS OF GROUND-WATER MODELING IN THE U.S. GEOLOGICAL SURVEY,
Geological Survey, Reston, Va. Water Resources Div.
C. A. Appel, and J. D. Bredehoeft.
Available from the Branch of Distribution, USGS, 1200 S. Eads St., Arlington, Va., 22202. Circular 737, 1976. 9 p, 1 tab, 93 ref.

Descriptors: *Groundwater, *Model studies, *Research and development, *Hydrogeology, *Aquifer characteristics, Groundwater movement, Land subsidence, Surface-groundwater relationships, Water pollution sources, Path of pollutants, Geothermal studies, Economic feasibility.
Identifiers: *Groundwater modeling.

The U.S. Geological Survey is active in the development and use of models for the analysis of various types of ground-water problems. Types of problems for which models have been, or are being, developed include: (1) ground-water flow in saturated or partially unsaturated materials, (2) land subsidence resulting from ground-water extraction, (3) flow in coupled ground water-stream systems, (4) coupling of rainfall-runoff basin models with soil moisture accounting and aquifer flow models, (5) interaction of economic and hydrologic considerations, (6) predicting the transport of contaminants in an aquifer, and (7) estimating the effects of proposed development schemes for geothermal systems. The status of modeling activity for various models is reported as being in a developmental, verification, operational, or continued improvement phase. Recently published references that provide useful details on the characteristics of the models are identified. (Woodard-USGS)
W77-02300

POTENTIAL FOR DEVELOPMENT OF GROUND WATER AT A TEST SITE NEAR TRURO, MASSACHUSETTS,
Geological Survey, Boston, Mass. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-02306

THE MERIDIAN-UPPER WILCOX AQUIFER IN MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-02310

STRATIGRAPHY OF THE PALEOCENE AND LOWER PART OF THE EOCENE IN WESTERN TENNESSEE,
Geological Survey, Nashville, Tenn. Water Resources Div.
W. S. Parks.
Tennessee Department of Conservation, Nashville, Division of Geology, Bulletin 75, p B1-B55, 1975. 34 fig, 1 plate, 2 tab, 67 ref.

Descriptors: *Geologic formations, *Stratigraphy, *Bedrock, *Fluvial sediments, *Tennessee, Hydrogeology, Groundwater, Aggregates, Geologic time, Geologic mapping, Petrology.
Identifiers: Western Tennessee, Paleocene, Eocene.

In 1965 the U.S. Geological Survey, Water Resources Division, in cooperation with the Tennessee Department of Conservation, Division of Geology, began a project to complete the geologic mapping of the outcrop area of the Paleocene and lower part of the Eocene in western Tennessee. The project area includes twenty-eight 7.5-minute quadrangles. The objective of the investigation was to provide detailed maps that would help inventory the mineral resources and to provide geologic information that would augment understanding of the ground-water resources in western Tennessee. The Clayton Formation and Porters Creek Clay (Midway Group) of the Paleocene Series and the Wilcox Formation and the lower part of the Claiborne Formation of the Eocene Series are the bedrock formations. The boundary between the Clayton Formation, the basal Paleocene unit, and the underlying formations of the Upper Cretaceous Series is within a sequence of similar sediments in most of western Tennessee. The fluvial deposits and alluvium make up surficial deposits, which cover the bedrock formations in extensive areas. Most of these deposits, which consist of sand, gravel, silt, and clay, are a part of the Pleistocene and Holocene Series, but some of the high-level fluvial deposits may be a part of the Pliocene Series. (Woodard-USGS)
W77-02315

GROUND-WATER RESOURCES AND GEOLOGY OF ST. CROIX COUNTY, WISCONSIN,
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-02321

GROUND-WATER HYDROLOGY OF THE COCOA WELL-FIELD AREA, ORANGE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-02323

ON THE SPECIES TRANSPORT EQUATION FOR FLOW IN POROUS MEDIA,
Systems, Science, and Software, La Jolla, Calif.
T. R. Blake, and S. K. Garg.
Water Resources Research, Vol. 12, No. 4, p 748-750, August 1976. 7 ref. NSF/RANN GI-44212.

Descriptors: *Porous media, *Continuity equation, *Theoretical analysis, Diffusion, Mixing, Equations, Analysis, Fluid mechanics, Momentum equation, Flow, Convection, Solutes.
Identifiers: *Mass transport, *Convective diffusion equation.

A derivation of the species transport equation for flow through porous media was presented. In this study, which was based on the space-averaging formalism developed by Anderson and Jackson, the effects of both flow field fluctuations and tortuosity as well as the influence of solute transport at the fluid-solid interfacial boundary were examined. (Adams-ISWS)
W77-02452

TRANSPORT OF MASS AND ENERGY IN POROUS MEDIA DUE TO NATURAL CONVECTION--THE GEOTHERMAL BASIN PROBLEM,
Colorado Univ., Boulder. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 4B.
W77-02507

DRAINAGE OF VERTICAL COLUMNS OF LAKELAND SAND,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-02510

DETECTION OF SUBSURFACE SOLUTION CAVITIES IN FLORIDA USING ELECTRICAL RESISTIVITY MEASUREMENTS,
Florida Univ., Gainesville. Dept. of Geology.
D. L. Smith, and A. F. Randazzo.
Southeastern Geology, Vol 16, No 4, p 227-240, May, 1975. 8 fig, 3 tab, 17 ref. OWRT A-025-FLA(1). 14-31-0001-5009.

Descriptors: *Groundwater movement, *Porosity, *Permeability, *Florida, *Resistivity, Measurement, Water level, Karst, Subsurface flow.

Preliminary electrical resistivity investigations in a low-relief karst terrain with a shallow water table provide a simple and inexpensive technique to identify possible water-filled solution cavities at shallow (0-50 feet) depths. Values from profiling and sounding measurements employing the Wenner electrode arrangement in Citrus County, Florida, were interpreted as indicative of solution cavities at a depth of 38 feet at one site and 20 feet at another. A shallow drilling program at the sites encountered solution voids at these depths, substantiating the effectiveness of the method. In addition, the measurements suggest lateral extent of the subsurface cavities and demonstrate a valuable auxiliary tool for the planning of drilling programs to detect subsurface cavities. (Morgan-Florida)
W77-02517

SEDIMENTOLOGY AND PALEOECOLOGY OF MIDDLE AND UPPER EOCENE CARBONATE SHORELINE SEQUENCES, CRYSTAL RIVER, FLORIDA, U.S.A.,
Florida Univ., Gainesville. Dept. of Geology.
A. F. Randazzo, and H. C. Saroop.
Sedimentary Geology, 15, p 259-291, 1976. 12 fig, 2 tab, 65 ref. OWRT A-025-FLA(2). 14-31-0001-5009.

Descriptors: *Groundwater movement, *Porosity, *Permeability, *Sedimentology, *Florida, *Petrography, Petrology, Diagenesis, Lithification, Carbonates.
Identifiers: *Crystal River(Fla), *Lithofacies.

Petrographic analyses of six cores penetrating the Inglis and Avon Park Formations, from Crystal River, Florida, reveal a general regressive-transgressive cycle, aerial exposure and diagenesis. Three distinct lithofacies are represented: (I) biomicrite-poorly washed biosparite; (II) dolomitized biopelmicrite-biosparite and algal dololithite; and (III) pellet and intraclast-bearing biosparite. These lithofacies were deposited under shallow-marine conditions, at times even above the strand line. Lithofacies I was deposited in a shallow basin partly covered by marine grasses and dasyclad algae. Lithofacies II was deposited in the supratidal and intertidal zones and closely resembles the sedimentary characteristics of Holocene mud-flat deposits. Lithofacies III is the shallow-marine counterpart of the supratidal dolostone of lithofacies II and can be compared with a Holocene bank environment. This study illustrates the importance of Holocene analogues in determining and interpreting environments and demonstrates the need to consider sedimentary processes, both physical and biological, which operate in these zones. (Morgan-Florida)
W77-02545

2G. Water In Soils

MAXIMIZING STOMATAL CONTROL AND ROOT SYSTEM TO OPTIMIZE WATER-USE EFFICIENCY IN SOYBEANS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 3F.
W77-02077

SEPTIC TANK EFFLUENT MOVEMENT THROUGH SOIL,
Maine Univ. at Orono. Dept. of Soil Chemistry.
For primary bibliographic entry see Field 5B.
W77-02087

THE USE OF A SPECIFIC ION ELECTRODE FOR DETERMINATION OF BROMIDE IN SOILS,
Texas Engineering Experiment Station, College Station.
A. B. Onken, R. S. Hargrove, C. W. Wendt, and O. C. Wilke.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1223-1225, November-December 1975. 3 tab, 9 ref.

Descriptors: *Bromides, *Electrodes, *Tracers, Soil tests, Soil investigations, Chloride, Anions, *Soil analysis, Water analysis, Pollutant identification, *Soil chemistry.

Bromide has desirable characteristics for use as a tracer for NO3- in some soil studies. However, its quantitative determination in the presence of Cl-, which occurs in interfering quantities in many soils, requires lengthy procedures. Further, Br- interferes with the quantitative determination of Cl- for which concentrations may also need to be determined. To facilitate the use of Br- as a tracer in such tests, a procedure for the rapid and accurate determination of water-extractable Br- in the presence of Cl- and Cl- in the presence of Br- was developed. These quantitative determinations over a wide range of concentrations were accomplished by use of standard curves, interference curves, and successive approximations. Bromide added to soil over a wide range of concentrations was quantitatively recovered. (Skogerboe-Colo St)
W77-02100

EFFECTS OF PHOSPHORUS ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF CLAYS,
West Pakistan Agricultural Univ., Lyallpur.
J. F. Lutz, and I. Hague.
Soil Science Society of America Proceedings, Vol. 39, No. 1, p 33-36, January-February 1975. 2 fig, 5 tab, 17 ref.

Descriptors: *Clays, *Phosphorus, Soils, Soil investigations, Soil chemistry, *Soil physical properties, Soil chemical properties, Phosphates, Clay minerals, Montmorillonite, Kaolinite, Hydration, Zeta potential, Hydrogen ion concentration, Soil treatment.

Montmorillonite, kaolinite, and a 1:1 mixture of them were treated with phosphorus at rates as high as 1,600 ppm using phosphoric acid and monocalcium phosphate. After 3 months the clays were examined for pH, zeta potential (charge), swelling, hydration in suspension, modulus of rupture of briquets, and water retention at 5 and 15 bars pressure. (Skogerboe-Colo St)
W77-02101

SULFUR FRACTIONS AND CARBON-NITROGEN-PHOSPHORUS-SULFUR RELATIONSHIPS IN SOME BRAZILIAN AND IOWA SOILS,
Iowa State Univ., Ames.
A. M. L. Neptune, M. A. Tabatabai, and J. J. Hanway.
Soil Science Society of America Proceedings, Vol 39, No 1, p 51-55, January-February 1975. 5 tab, 28 ref.

Descriptors: *Sulfur, Soils, Soil properties, Soil tests, Iowa, *Carbon, *Nitrogen, *Phosphorus, South America.
Identifiers: *Brazilian soils, *Iowa soils.

Current knowledge concerning the percentage distribution of the various S fractions in soils is mainly derived from studies of S in surface soils of temperate regions. This study was conducted to determine the S fractions and C-N-P-S relationships in some subtropical soils from Brazil and to compare the values in these soils with those in soils of a temperate region from Iowa. (Skogerboe-Colo St)
W77-02102

VEGETATION AND SOIL OF SALINE DEPRESSIONS NEAR NAJAF, CENTRAL IRAQ,
Baghdad Univ., (Iraq). Dept. of Botany.
For primary bibliographic entry see Field 3C.
W77-02116

RELATIVE IMPORTANCE OF SOIL RESISTANCE AND PLANT RESISTANCE IN ROOT WATER ABSORPTION,
Agricultural Research Service, Florence, S. C. Southern Region.
For primary bibliographic entry see Field 2D.
W77-02118

EXPERTS CLING TO WATER MYTHS,
For primary bibliographic entry see Field 3F.
W77-02120

SCOURING OF COHESIVE SOILS,
Howard Univ., Washington, D. C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W77-02127

SEEPAGE FROM TRAPEZOIDAL CANAL IN ANISOTROPIC SOIL,
Indian Inst. of Science, Bangalore. Dept. of Civil Engineering.
A. S. Reddy, and U. Basu.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 102, No. IR3, Proceedings Paper 12386, p 349-361, September 1976. 6 fig, 28 ref, 2 append.

Descriptors: *Irrigation, *Seepage, *Canals, Irrigation canals, Permeability, Anisotropy, Homogeneity, Phreatic lines, Hydrology, Hydraulics, Equations, Flow.
Identifiers: *Conformal mapping, Vedernikov's solution.

An analytical solution which takes into account the general anisotropic behavior of the porous medium was found for the problem of seepage flow from an unlined trapezoidal canal. Since a canal in an anisotropic medium transforms into one with unequal slopes in an equivalent isotropic porous medium, the solution here was concerned with the problem of seepage flow from an unsymmetrical trapezoidal canal. The method of inversion of hodograph was made use of, and expressions for the seepage loss and the locations of the phreatic lines were obtained. Numerical results were presented for the equivalent isotropic flow domain. Using the transformation formulas given, the actual discharge and the locations of phreatic lines in anisotropic medium can be easily obtained for given physical parameters of the actual flow domain. The nonsymmetry of trapezoidal canals of side slopes less than one has considerable influence on the quantity of seepage. (Lee-ISWS)
W77-02137

INFLUENCE OF DIFFERENT WATER REGIMES ON OXYGEN DIFFUSION RATES, NUTRIENT UPTAKE, GROWTH AND YIELD OF WHEAT,
Indian Agricultural Research Inst., New Delhi.
For primary bibliographic entry see Field 3F.
W77-02177

TRANSIENT MOVEMENT OF WATER AND SOLUTES IN UNSATURATED SOIL SYSTEMS, PHASE II,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
D. D. Evans, T. W. Sammis, and A. W. Warrick.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 348, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, September 1976. 40 p, 14 fig, 9 tab, 12 ref. OWRT B-040-ARIZ(1). 14-31-0001-4059.

Descriptors: *Unsaturated flow, *Tritium, *Soil water movement, *Arizona, *Solutes, Deep percolation, *Seepage, Methodology, Salts, Aquifers, Water quality, Pollutant identification, Darcys law.
Identifiers: Deep seepage, Temperature profiles, *Phoenix(Ariz).

This project yielded results on the movement of water and solutes from beneath the root zone to a water table aquifer in an irrigated area near Phoenix, Arizona. Three methods were explored for estimating deep seepage rates. They were: (1) measurement of the hydraulic conductivities and gradients and by Darcy's equation calculating the seepage rate; (2) measurement of the temperature profile and calculating the seepage rate from the shape of the profile curve; and (3) measurement of he tritium concentation of the soil water and relating it to the history of the tritium concentration of precipitation. The different methods were used at one site where a deep well was drilled to obtain samples, but the temperature-profile method was tried at other locations. Errors are involved in all of the methods so results differed. At the principal site of study the Darcian velocity estimate (volume of flow per unit area per unit time) ranged from 9 to 38 cm/yr, while the actual velocity estimate (pore velocity) ranged from 57 to 130 cm/yr. The results from other sites indicated an even lower rate of seepage. The solute concentration of the soil water was higher than the aquifer water but, at the one site, the effect of salts in the seepage water should not significantly alter the quality of the aquifer water. (See also W74-01104)
W77-02189

MOVEMENT OF FERTILIZER AND HERBICIDE THROUGH IRRIGATED SANDS,
Florida Univ., Gainesville. Dept. of Soil Science; and Florida Univ., Gainesville. Inst. of Food and Agriculture.
For primary bibliographic entry see Field 5B.
W77-02219

NITROGEN IN THE SOIL WATER OF THE ECOSYSTEM OF THE AMAZONIAN PRAIRIES, (IN PORTUGESE),
Instituto Nacional de Pesquisas da Amazonia Manaus (Brazil).
For primary bibliographic entry see Field 5B.
W77-02239

TRACE ELEMENTS IN SOILS OF THE DNIEPER-BUG LIMAN, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
M. A. Truba, and O. P. Nakhshyna.
Dopov Akad Nauk Ukr Rsr Ser B Heol Heofiz Khim Biol 10, p 950-953, 1975.

Descriptors: *Trace elements, *Soil analysis, *Copper, *Manganese, Distribution patterns, Or-

ganic matter, Nitrogen, Carbon, Oxidation-reduction potential, Rivers, River beds.
Identifiers: Dnieper-Bug Rivers(USSR), *Liman soils.

The Cu content of the liman soils was 10(-5) -5.10(-3%) and that of MN 10(-2) -4.10(-1%). The distribution over the bottom was determined by the mechanical composition of the soil and its content of organic matter. Statistical calculations confirmed the close correlation between the content of Cu and Mn and Corg and Norg. An average inverse dependence on the pH value and redox potential of the soil columns was determined for Mn (USSR).--Copyright 1976, Biological Abstracts, Inc.
W77-02258

EXTRACTION-PHOTOMETRIC DETERMINATION OF MERCURY IN SOIL AND WATER, (IN RUSSIAN),
Uzhgorod State Univ. (USSR).
For primary bibliographic entry see Field 5A.
W77-02272

NITROGEN FIXATION BY ALGAE IN FESCUEGRASS SOIL CRUSTS,
Georgia Univ., Athens. Dept. of Agronomy.
G. B. Reddy, and J. Giddens.
Soil Science Society of America Proceedings, Vol. 39, No. 4, p 654-656, July-August 1975. 1 fig, 3 tab, 21 ref.

Descriptors: *Grasses, *Subsoils, *Nitrogen fixation, Nitrogen, Nutrients, Algae, Fertilization, Carbon, Fescues.

Soil crusts and subsoil samples of different ages of tall fescuegrass were collected and analyzed for N, C, and acetylene reduction. Total N and C in the crust was 0.18% and 2.76%, respectively, in 4-year old soil crust as compared to 0.06% and 0.67% respectively, in fallow soil. The amount of acetylene reduction after 5 days' incubation was 13.77 micro-mole/flash (9.6 cm2) for the 4-year-old sod crust compared to 3.06 micro-mole/flask for the fallow control. Ammonium nitrate reduced and liming increased N fixation in the crust. Nitrogen fixation in the crust was highest at 55% shade. Greater nitrogen fixation occurred when moss was present in crust. (Skogerboe-Colo St)
W77-02274

RATE OF DISSOLUTION OF PHOSPHATE FROM MINERALS AND SOILS,
Montana State Univ., Bozeman. Dept. of Chemistry.
R. A. Olsen.
Soil Science Society of America Proceedings, Vol. 39, No. 4, p 634-639, July-August 1975. 9 fig, 2 tab, 18 ref.

Descriptors: *Phosphates, Nutrients, Soil investigations, Laboratory tests, Roots, Minerology, Dispersion, Path of pollutants.

A laboratory technique was devised for conveniently measuring the rate of dissolution of phosphates in minerals and soils. The conditions imposed upon the samples were believed to be similar in several important respects to those in the close proximity of plant roots. An equation was derived which was reasonably descriptive of the dissolution process even in widely different soils. The technique was used to measure the rate of dissolution of a number of well-characterized rock phosphate samples and of may soils. The data were found to rate the samples very well with regard to their value as a source of phosphate to plants. (Skogerboe-Colo St)
W77-02275

THE EFFECT OF AMMONIA AND AMMONIA-SULFUR SOLUTIONS ON NITRIFICATION RATES AND CHEMICAL PROPERTIES OF A CALCAREOUS SOIL,
Texas Tech Univ., Lubbock. Dept. of Agronomy.
R. G. Stevens, and J. O. Reuss.
Soil Science Society of America Proceedings, Vol. 39, No. 4, p 787-793, July-August 1975. 7 fig, 2 tab, 25 ref.

Descriptors: *Nitrification, *Soil chemistry, *Soil chemical properties, *Chemical properties, *Ammonia, Soil properties, Nitrates, Nitrites, Sulfur.
Identifiers: Ammonia-sulfur solutions, Calcereous soils.

Nitrification rates and changes in chemical properties of a calcareous soil were investigated after injection of liquid anhydrous NH3 and anhydrous NH3-S solutions. Nitrification rates (on a whole pot basis) of 15.7, 25.3, and 32.2 mg of N per pot per day were found with the application of 200, 400, and 600 mg of N/pot, respectively. These nitrification rates were recorded during the initial 14 days of the study when total NO3- accumulation appeared to be linear. (Skogerboe-Colo St)
W77-02276

POTASSIUM-CALCIUM EXCHANGE EQUILIBRIA IN VOLCANIC-ASH SOILS,
Chile Univ., Santiago. Dept. of Chemistry.
E. B. Schalscha, P. F. Pratt, and L. Andrade.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1069-1072, November-December 1975. 3 fig, 4 tab, 12 ref.

Descriptors: *Potassium, *Calcium, Soils, Soil investigations, Soil chemistry, Chemical reactions, Equilibrium, *Cation exchange, Ion exchange.
Identifiers: *Potassium-calcium exchange equilibria, *Chile(Soils), *Volcanic-ash soils.

Potassium-Ca exchange equilibria were determined at potassium adsorption ratios (PAR) of 0.2, 2.0, and 20 for pH values of 4.8, 6.0, and 7.5 for four volcanic-ash soils of southern Chile. Increases in pH produced large increases in cation exchange capacity (CEC) which were largely balanced by increases in the amount of Ca adsorbed. The increases in exchangeable K with increase in CEC were relatively small. The relative affinities for K versus Ca at a PAR of 0.2 indicated that for each soil a small, but nearly constant, amount of negative charge had a high specificity for K. Beyond this small amount of CEC with a high affinity for K, the affinities for K were relatively low. (Skogerboe-Colo St)
W77-02277

A MODEL FOR THE SIMULTANEOUS PRODUCTION AND DIFFUSION OF FERROUS IRON IN SUBMERGED SOILS,
Agricultural Univ., Wageningen (Netherlands). Dept. of Soils and Fertilizers.
K. Harmsen, and N. Van Breemen.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1063-1068, November-December 1975. 4 fig, 19 ref.

Descriptors: *Model studies, *Iron, *Saturated soils, Soil horizons, Soils, Soil investigations, Rice, Diffusion, Path of pollutants, Soil profiles.
Identifiers: Rice paddy soils.

The model describes the distribution of dissolved ferrous iron as a function of time and depth in a flooded soil profile consisting of three distinct horizons. In this soil profile, the production of dissolved ferrous iron is high and constant with depth in the surface horizon, low and constant with depth in the subsoil, and varies linearly with depth between these two values in the intermediate horizon. The Fe2+ concentration is found as the difference of the rate of ferrous iron production, integrated over time and a diffusion term consisting of an infinite series of the third and fifth repeated integral of the complementary error function. The parameters considered are (1) three constants specifying the dependence of the ferrous iron formation on time and depth, (2) the depths of the three horizons, and (3) the apparent diffusion coefficient. As shown by one example, the general solution can be greatly simplified for many cases of practical interest. The inherent assumptions of the model and its application to actual waterlogged soils are discussed. (Skogerboe-Colo St)
W77-02278

INITIAL RELEASE OF NITROGEN FROM UREAFORM UNDER FIELD CONDITIONS,
Agricultural Research Organization, Bet-Dagan (Israel). Inst. of Soils and Water; Agricultural Research Organization, Bet-Dagan (Israel). Div. of Soil Chemistry and Plant Nutrition.
For primary bibliographic entry see Field 3F.
W77-02279

FIXATION OF IRON AND ZINC APPLIED AS CHELATES INTO A SOIL COLUMN DURING LEACHING,
Hebrew Univ., Rehovoth (Israel). Dept. of Soil and Water Science.
N. Lahav, and M. Hochberg.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1213-1215, November-December 1975. 4 fig, 3 ref.

Descriptors: *Iron, *Zinc, *Leaching, Infiltration, Soil investigations, Sands, Chelation.
Identifiers: *Soil columns, Breakthrough curves.

The movement of iron in the form of FeEDDHA and FeEDTA and zinc in the form of ZnEDTA was studied in columns of Rehovot sand under several flow rates and in the presence of either Ca(N03)2 or KN03 with the same ionic strength of 0.0375M/liter. Chloride was used as a tracer. FeEDDHA was neither adsorbed nor fixed by the soil. Both ZnEDTA and FeEDTA were fixed in the soil column in the presence of Ca2+ but not in the presence of K+. ZnEDTA was not adsorbed significantly, whereas FeEDTA was adsorbed in the presence of either KN03 or Ca(N03)2 solutions. Reasonable agreement was obtained between experimental results and theoretical calculations of the breakthrough curves, based on the analytical solution of the general dispersion equation. (Skogerboe-Colo St)
W77-02280

CROP PRODUCTION FUNCTION DETERMINATIONS AS INFLUENCED BY IRRIGATION AND NITROGEN FERTILIZATION USING A CONTINUOUS VARIABLE DESIGN,
North Dakota State Univ., Fargo. Dept. of Soil Science and Biometerology.
For primary bibliographic entry see Field 3F.
W77-02281

EFFECT OF LIME ON BORON TRANSPORT TO AND UPTAKE BY COTTON,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
For primary bibliographic entry see Field 3F.
W77-02282

DISSOLUTION OF ILLITE--A POSSIBLE MECHANISM OF POTASSIUM RELEASE,
Agricultural Research Organization, Bet-Dagan (Israel). Inst. of Soils and Water.
S. Feigenbaum, and I. Shainberg.
Soil Science Society of America Proceedings, Vol. 39, No. 5, p 985-990, September-October 1975. 3 fig, 2 tab, 18 ref.

Descriptors: *Potassium, *Aluminum, *Iron, *Magnesium, *Illite, Chemical reations, Diffusion, Soils.

The rate of potassium, aluminum, iron and magnesium release from Fithian illite in dilute salt

solutions and at pH > 3 was studied. Cumulative cation release was proportional to the square root of the duration of the treatment. The rate of Al release was similar to the rate of K release, whereas the rate of Fe and Mg release was about three x that of K and Al release. Since the only known mechanism for the release of the lattice cations is the dissolution of the clay, it is proposed that dissolution of the clay lattice is also the dominant mechanism by which potassium is released from the clay. Two consecutive reactions, a rapid exchange reaction and a slow first-order reaction, explain the experimental observations. (Skogerboe-Colo St)
W77-02283

SOIL CHANGES RESULTING FROM CROPPING,
Agricultural Research Service, Manhattan, Kans.
E. L. Skidmore, W. A. Carstenson, and E. E. Banbury.
Soil Science Society of America Proceedings, Vol. 39, No. 5, p 964-967, September - October 1975. 3 fig, 2 tab, 24 ref.

Descriptors: *Crops, Crop production, *Soil investigations, *Soil properties, Grasses, Pastures, Soil structure, Organic matter, Cultivation.

The need to document further the changes in soil properties from various cropping systems and the uniqueness of a long-time cultivated field adjacent to buffalograss pasture prompted the evaluation of soil-property changes of a Keith silt loam characteristic of that pasture and field. In the fall of 1973, the sod of the buffalograss pasture was broken for analysis. Soil samples were obtained from the pasture (newly broken sod) and the adjacent cultivated field. The wet aggregates from the pasture were stabler as compared with the cultivated field for both flash and vacuum wetting. However, the dry aggregates from the cultivated field were slightly stabler than those from the pasture. (Skogerboe-Colo St)
W77-02284

A THERMODYNAMIC MODEL FOR PREDICTING THE FORMATION, STABILITY, AND WEATHERING OF COMMON SOIL MINERALS,
Batelle-Northwest, Richland, Wash.
D. Rai, and W. L. Lindsay.
Soil Science Society of America Proceedings, Vol. 39, No. 5, p 991-996, September-October 1975. 5 fig, 2 tab, 33 ref.

Descriptors: *Model studies, *Weathering, Soils, Soil investigations, Mineralogy.
Identifiers: *Mineral transformations, *Thermodynamic models.

Numerous workers have examined the weathering products of soil minerals and have proposed empirical weathering sequences. Development is described of a thermodynamic model that predicts in a systematic way several mineral transformations that can occur in soils. According to this model, the stability of primary minerals increases in the order: Na-glass, K-glass, pyroxene, analcime, anorthite, low albite, muscovite, microcline, and quartz. The stability of secondary clay minerals depends on soluble silica. At pH 6 with high silica the order of increasing stability is: chlorite, halloysite, gibbsite, illite, dickite, beidellite, kaolinite, and montmorillonite; at low silica the order is: chlorite, halloysite, illite, beidellite, montmorillonite, dickite, kaolinite, and gibbsite. The stability of both primary and secondary minerals increases with pH. (Skogerboe-Colo St)
W77-02285

EFFECT OF DEGREE OF SOIL PROFILE DISRUPTION ON PLANT GROWTH AND SOIL WATER EXTRACTION,
Academy of Agricultural Sciences, Sofia (Bulgaria). Inst. of Soil Science.
K. Rakov, and H. V. Eck.
Soil Science Society of America Proceedings, Vol. 39, No. 4, p 744-746, July-August 1975. 3 fig, 3 tab, 9 ref.

Descriptors: *Soil profiles, *Infiltration, Soil investigations, Soil environment, Soil water, Soil horizons, Permeability.

Modification of slowly permeable soil profiles has been effective in ameliorating undesirable soil conditions. Various methods and depths of modification have been studied but little attention has been given to (1) the degree of disruption necessary to accomplish satisfactory profile modification or (2) the relative merits of topsoil-subsoil mixing and stockpiling and returning topsoil to the surface after profile modification. Seven degrees of profile disruption (clod size distributions in the B22t and mixing of topsoil with that horizon) were studied in simulated soil profiles in the greenhouse. Grain sorghum was grown on Pullman clay loam. Disturbance of the B22t layer increased yields but once that layer was disturbed, degree of disturbance had no further effect on yield. Compared with retaining topsoil on the surface, mixing it with the B22t did not affect yields. (Skogerboe-Colo St)
W77-02286

INTERACTIONS OF MICRONUTRIENTS IN BARLEY GROWN ON ZINC-POLLUTED SOILS,
Himachal Pradesh Univ., Palampur (India).
B. R. Singh, and K. Steenberg.
Soil Science Society of America Proceedings, Vol. 39, No. 4, p 674-679, July-August 1975. 2 fig, 7 tab, 41 ref.

Descriptors: *Nutrients, *Barley, *Zinc, Soil tests, Soil investigations, Crop response, Water pollution sources.
Identifiers: *Micronutrients.

Barley grown in zinc-polluted soils with variable levels of Zn, Mn, and Fe showed no marked differences in the yield attributable to these variables in both soils investigated. However, in direct contrast to results reported by other investigators, concentrations of 65Zn and total zinc were found to increase with increased levels of added Mn and/or Fe with few exceptions. Similarly, concentrations of 54Mn and total Mn also increased with increased levels of Zn and/or Fe. The effects of Zn and Mn on the concentrations of 59Fe and total Fe were inconsistent. The concentration of Mo was found to decrease with increased levels of Zn, Mn, and Fe and the decrease was more pronounced in one soil than in the other. (Skogerboe-Colo St)
W77-02287

ENVIRONMENTAL IMPLICATIONS OF N FIXATION BY SOYBEANS,
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
For primary bibliographic entry see Field 3C.
W77-02289

NITRATE-NITROGEN REMOVAL FROM SOIL PROFILES BY ALFALFA,
Southwestern Great Plains Research Center, Bushland, Tex.
A. C. Mathers, B. A. Stewart, and B. Blair.
Journal of Environmental Quality, Vol. 4, No. 3, 1975. p 403-405, 3 fig, 3 tab, 12 ref.

Descriptors: *Nitrates, *Nitrogen, *Alfalfa, Crop response, Crop production, Phosphorus, Soil investigations, *Soil profiles, *Farm wastes, *Nutrient removal.
Identifiers: *Nitrate-nitrogen removal.

Alfalfa was established in the fall of 1971 on plots previously treated with 0, 22, 45, 112, or 224 metric tons/ha of manure annually for 3 years. Additional plots had received 224 kg N/ha annually for 3 years. Nitrate-nitrogen and water contents of the soil profile were determined by 30-cm increments to 6 m prior to planting. Nitrate-nitrogen was found to 6 m, but the largest concentrations were in the top 1.8 m, where amounts of NO3(-)-N varied from 100 to 2,400 kg/ha. Additional profile samples were taken in 1972 and 1973 after the final cutting of alfalfa. Alfalfa removed water and NO3(-)-N to a 1.8-m depth the first year and to 3.6 m the second year. These results indicate that alfalfa could remove NO3(-)-N from the lower depth of soil profiles where annual crops were not effective. Yield, NO3(-)-N, and P contents of alfalfa were increased by manure. Total N taken up by the crop was directly related to the yield. (Skogerboe-Colo St)
W77-02290

A COMPARISON OF NITROGEN, PHOSPHORUS, AND CARBON IN SEDIMENTS AND SOILS OF CULTIVATED AND NONCULTIVATED WATERSHEDS IN THE NORTH CENTRAL STATES,
Agricultural Research Service, Oxford Miss.
For primary bibliographic entry see Field 5G.
W77-02292

NITROGEN LOSSES FROM SOILS OF THE NORTH CAROLINA COASTAL PLAIN,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W77-02294

SIMULATION OF ROOT-ZONE WATER AND DEEP SEEPAGE TO A WATER TABLE,
Connell/Metcalf and Eddy, Coral Gables, Fla.
T. G. King, and J. R. Lambert.
Presented at the 1975 Winter Meeting of the American Society of Agricultural Engineers, December 15-18, 1975, Chicago, Illinois, 12 p. 5 fig, 2 ref.

Descriptors: *Model studies, *Root zone, Moisture tension, Soil water, *Soil water movement, *Seepage, *Water table, Evapotranspiration, *Computer models, Simulation analysis.

The primary objective was to develop a computer model that would simulate the quantity and movement of water in the deep seepage region, i.e., between the root zone and the water table. Effort was also directed towards simulating evapotranspiration and the movement of the water table. The model has been structured so that it may readily be modified to other locations where basic meteorological records and soil data are available. (See also W76-09245) (Skogerboe-Colo St)
W77-02295

POTASSIUM IN AN ARID LOESSIAL SOIL: CHARACTERIZATION BY EQUILIBRIUM RELEASE-ABSORPTION TO STRONG SALT SOLUTIONS,
Washington State Univ., Pullman. Coll. of Agriculture Research Center.
D. W. James, and W. H. Weaver.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1106-111, November-December 1975. 6 fig, 1 tab, 24 ref.

Descriptors: *Potassium, Soil chemistry, Soil investigations, Sodium, Magnesium, Calcium, Absorption, Loam, Silicates.

Shano silt loam soil developed from loessial and volcanic materials of recent origin under mild weathering conditions. It contains less than 5% of clay and 60% or more of silt. The rate of release of mineral K (Km) in this soil to 1N C1 solutions decreased in the order Na greater than Ca greater than Mg much greater than NH4. Release of Km may have involved some framework silicates, but for practical purposes the layer silicates controlled Km activity. (Skogerboe-Colo St)

W77-02296

SOYBEAN YIELD RESPONSES AND ASSIMILATION OF ZN AND CD FROM SEWAGE SLUDGE-AMENDED SOIL,
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W77-02377

MOVEMENT OF HEAVY METALS BELOW SEWAGE DISPOSAL PONDS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-02379

ENVIRONMENTAL IMPACTS OF LAND APPLICATION OF SLUDGE,
Metropolitan Sanitary District of Greater Chicago, Ill. Dept. of Research and Development.
For primary bibliographic entry see Field 5D.
W77-02391

GAS AND LEACHATE FROM LANDFILLS: FORMATION, COLLECTION, AND TREATMENT. PROCEEDINGS OF A RESEARCH SYMPOSIUM.
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5E.
W77-02394

THEORETICAL APPROACH TO GAS MOVEMENT THROUGH SOILS,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-02401

LEACHATE ATTENUATION IN UNDISTURBED AND REMOULDED SOILS,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-02403

LEACHATE MIGRATION THROUGH SELECTED CLAYS,
Illinois State Geological Society, Urbana.
For primary bibliographic entry see Field 5B.
W77-02406

ATTENUATION MECHANISMS OF POLLUTANTS THROUGH SOILS,
Arizona Univ., Tucson. Coll. of Agriculture.
For primary bibliographic entry see Field 5B.
W77-02408

MONITORING TOXIC CHEMICALS IN LAND DISPOSAL SITES,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5A.
W77-02409

CASE HISTORY OF LANDFILL GAS MOVEMENT THROUGH SOILS,
Cook Coll., New Brnswick, N. J.
For primary bibliographic entry see Field 5E.
W77-02413

REMOTE SENSING OF SOIL MOISTURE BY A 21-CM PASSIVE RADIOMETER,
Kansas Univ. Lawrence.
J. R. Eagleman, and W. C. Lin.
Journal of Geophysical Research, Vol. 81, No. 21, p 3660-3666, July 20, 1976. 6 fig, 2 tab, 16 ref. NASA NAS-9-13273.

Descriptors: *Remote sensing, *Soil moisture, *Microwaves, Satellites(Artificial), On-site data collections, Regression analysis, Precipitation(Atmospheric), Evaporation, Measurement, Vegetation, Vegetation effects, Temperature, Surveys.
Identifiers: *Skylab, Radiometers, Passive radiometers.

Microwave sensors on Skylab collected data as part of the Earth Resources Experiment Package (EREP). An investigation was designed to obtain field observations of soil moisture content for comparison with data from Skylab. The 21-cm radiometer was shown to be highly responsive to the moisture content of the upper 2.5-cm layer of soil. A composite relationship between the radiometric temperature and soil moisture content was determined from five data sets obtained over Kansas and Texas. This relationship, having a correlation index of -0.96, has been used as a basis for calculating the soil moisture content of large areas across the United States. (Sims-ISWS)
W77-02480

SATELLITE MICROWAVE OBSERVATIONS OF SOIL MOISTURE VARIATIONS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
T. J. Schmugge, A. Rango, and R. Neff.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-15553, Price Codes: A03 in paper copy, A01 in microfiche. Preprint X-913-75-304, November 1975. 31 p, 10 fig, 2 tab, 5 ref.

Descriptors: *Remote sensing, *Vegetation, *Soil moisture, *Microwaves, Satellites(Artificial), Surveys, Measurement, Precipitation(Atmospheric), Evaporation, Vegetation effects, Soils, Agriculture.
Identifiers: *Microwave brightness temperature, Microwave emission.

The Electrically Scanning Microwave Radiometer (ESMR) on the Nimbus 5 satellite was used to observe microwave emissions from vegetated and soil surfaces over an Illinois-Indiana study area, the Mississippi Valley, and the Great Salt Lake Desert in Utah. Analysis of microwave brightness temperatures (T sub B) and antecedent rainfall over these areas provided a way to monitor variations of near-surface soil moisture. Because vegetation adsorbs microwave emission from the soil at the 1.55 cm wavelength of ESMR, relative soil moisture measurements can be obtained only over bare or sparsely vegetated soil. In general, T sub B increases during rainfree periods as evaporation of water and drying of the surface soil occurs, and drops in T sub B are experienced after significant rainfall events wet the soil. Microwave observations from space are limited to coarse resolutions (10-25 km), but it may be possible in regions with sparse vegetation cover to estimate soil moisture conditions on a watershed or agricultural district basis, particularly since daily observations can be obtained. It was concluded that further applications to agriculture and water resources need to be explored. (Sims-ISWS)
W77-02495

DRAINAGE OF VERTICAL COLUMNS OF LAKELAND SAND,
Florida Univ., Gainesville. Dept. of Soil Science.
G. K. Saxena, R. S. Mansell, and C. C. Hortenstine.
Soil Science, Vol. 120, No. 1, p 1-12, July 1975. 10 fig, 13 ref. OWRT A-026-FLA(4). BOM G0190838 (SWD-24).

Descriptors: *Drainage, *Sands, *Soil water, *Florida, Clays, Percolation, Retention, Stratification, Hydraulic conductivity, Columns, Hydraulic gradient, Infiltration, Root zone, Unsaturated flow, Phosphates, Velocity, Laboratory tests, Sieve analysis, Bulk density, Tensiometers, Discharge(Water).

Identifiers: *Lakeland sand, Phosphatic clay, Suction head, Time-dependence, Trickle irrigation.

A drainage experiment was conducted to determine the time-dependence of soil-water retention during drainage of a quasi-uniform column of Lakeland sand and similar columns to which phosphatic clay was added as an amendment or layer. Phosphatic clay was observed to increase and prolong water retention in the soil. Saturated hydraulic conductivity of the column with soil amended with 5% phosphatic clay in the surface 30 cm was 13 cm/hr, as compared to 25 cm/hr for the quasi-uniform column of Lakeland sand. Drainage from the columns with 1-cm-thick and 2-cm-thick layers of phosphatic clay aggregates was greatly restricted. The nonaggregated phosphatic clay layer provided nearly constant impedence to flow across the layer, whereas successive water desaturation of the larger pores in the layer aggregates resulted in a time-dependent impedence to water flow. At saturation the hydraulic conductivities of the aggregated and nonaggregated clay layers were calculated to be 5.0 and 0.8 cm/hr, respectively. Maximum hydraulic head gradients across the aggregated and nonaggregated clay layers were 4 and 13, respectively. Values of unsaturated hydraulic conductivity calculated from soil-water characteristic curves for the Lakeland sand and measured water-saturated hydraulic conductivity were in good agreement with values measured experimentally from the soil columns. (Visocky-ISWS)
W77-02510

NUTRIENT DISTRIBUTIONS IN A SPODOSOL DURING CORN GROWTH,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W77-02516

SOIL WARMING WITH POWER PLANT WASTE HEAT IN GREENHOUSES,
Oregon State Univ., Corvallis. Dept. of Soil Science.
For primary bibliographic entry see Field 5G.
W77-02526

MODELING REACTIONS AND TRANSPORT OF POTASSIUM IN SOILS,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W77-02529

CALCIUM EQUILIBRIUM IN MIXED ION AQUEOUS SYSTEMS OPEN TO THE ATMOSPHERE,
New Mexico State Univ., Las Cruces. Dept. of Agronomy.
For primary bibliographic entry see Field 2K.
W77-02538

DISTRIBUTIONS OF 2,4-D AND WATER IN SOIL DURING INFILTRATION AND REDISTRIBUTION,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W77-02542

2H. Lakes

IDENTIFICATION AND QUANTIFICATION OF WATER QUALITY CHANGE INDUCTING MECHANISMS IN STRATIFIED RESERVOIRS,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W77-02089

SEDIMENTATION RATES AND SEDIMENT THICKNESSES IN LAKE CHAMPLAIN: 1975-76,
Vermont Univ., Burlington. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W77-02193

EAGLE LAKE POLLUTION CONTROL PROJECT, EAGLE LAKE KANDIYOHI COUNTY, MINNESOTA, BENCH MARK STUDIES,
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 5G.
W77-02215

GEOLOGIC AND PHYSICAL FACTORS AFFECTING LAKE CHAMPLAIN SHORELINE EROSION,
Vermont University, Burlington, Dept. of Geology.
For primary bibliographic entry see Field 2J.
W77-02222

EFFECTS ON THE PHOSPHOROUS SITUATION IN LAKE RADASJON ON CHANGES IN THE POLLUTION SITUATION, (IN SWEDISH),
Goteborg Univ. (Sweden). Inst. of Zoology.
For primary bibliographic entry see Field 5C.
W77-02227

EFFECT OF MINE WASTEWATERS ON THE WATER QUALITY OF THE OL'KHOVOYE RESERVOIR, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W77-02242

SOME ASPECTS OF THE CHEMICAL COMPOSITION OF TRAPA NATANS L. IN LAKE MAGGIORE (ITALY), ESPECIALLY MANGANESE AND IRON, (IN FRENCH),
European Atomic Energy Community, Ispra (Italy).
For primary bibliographic entry see Field 5C.
W77-02250

PRODUCTION OF PHYTOPLANKTON OF LAKE BAIKAL IN THE REGION OF LISTVENNICHNOYE VILLAGE, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
For primary bibliographic entry see Field 5C.
W77-02253

CHEMICAL COMPOSITION OF BLUE-GREEN ALGAE IN THE KREMENCHUG RESERVOIR, (IN RUSSIAN),
Tekhnologicheskii Institut Pishchevoi i Kholodilnoi Promyshlennosti, Odessa (USSR).
For primary bibliographic entry see Field 5C.
W77-02254

ELEMENTS OF LIMNOLOGICAL SPECIFICITY OF LARGE LAKES IN THE TEMPERATE ZONE, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Institut Ozerovedeniya.
I. I. Nikolaev.
Gidrobiol Zh 11(6), p 5-10, 1975.

Descriptors: *Lakes, *Limnology, Algae, Canada, *Oligotrophy, *Photosynthesis, Zooplankton, *Temperate, Great Lakes, United States, Fish, Invertebrates.

The specificity of the nature of large lakes is directly or indirectly dependent on their limnological scale. Oligotrophy of large deep lakes of the temperate zone is determined by small specific mobilization of biogens from the land, their slow regeneration in the water and limited evacuation from deep water to the photosynthetic zone. Certain phenomena in the regime of large lakes make them similar to seas (stability of hydrological, hydrochemical and biological conditions, upwelling, wind surf in the littoral, etc.). Limnological specificity of large lakes is most pronounced in the temperate zone, E.G., Lake Ladoga, Lake Onega, Lake Baikal (USSR), the American Great Lakes (USA, Canada). Algae, zooplankton, invertebrates and fish are discussed.--Copyright 1976, Biological Abstracts, Inc.
W77-02260

PREDICTED AND OBSERVED TEMPERATURE AND WATER-QUALITY CHANGES OF LAKES AND RESERVOIRS,
Geological Survey, Lakewood, Colo. Water Resources Div.
D. B. Adams.
Reprint from International Symposium on the Hydrological Characteristics of River Basins and the Effects on these Characteristics of Better Water Management, held in Tokyo, Japan, December 1975: International Association of Hydrological Sciences Publication No. 117, p 873-882, 1975. 15 fig, 9 ref.

Descriptors: *Model studies, *Reservoirs, *Water temperature, *Water quality, Forecasting, Inflow, Solar radiation, Specific conductivity, Discharge(Water), Correlation analysis, Data collections, Evaluation, Environmental effects, Dam design.

The model is a time-dependent, one-dimensional model that describes the temperature and water quality variation in the vertical direction and is based on the absorption and transmission of solar radiation, convection due to surface cooling, and advection due to inflows and outflows. The model was verified by simulation of the thermal and specific conductance distribution of Flaming Gorge Reservoir, Utah-Wyoming, during a 10-month period in 1972. Agreement between predicted and measured temperature profiles are excellent, with differences in localized areas being a maximum of 1.5 deg C. For 1972, maximum predicted discharge temperatures in the stream below the reservoir were 1.3 deg C less than those observed; agreement with time of maximum temperature is excellent. The actual average annual discharge temperature decreased 10 deg C after closing the dam. Specific conductance predictions in the reservoir, based on daily specific conductance inflow data, are very good and show the development of characteristic 'bulges or concavities' observed in the field profiles. This indicates that the solute distribution is indeed controlled by the hydrodynamics of the system. The model provides data useful for evaluating the design of the outlet structure of the proposed dam, the primary concern being to maintain a desired temperature range to control downstream quality and environmental effects. (Woodard-USGS)
W77-02304

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 1. NORTH ATLANTIC SLOPE BASINS--VOLUME 3. BASINS FROM MARYLAND TO YORK RIVER.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-02307

CALORIC INVESTIGATIONS ON THE SHORE COMMUNITY OF A FISH POND, (IN GERMAN),
Bonn Univ. (West Germany). Institut fuer Landwirtschaftliche Zoologie und Bienenkunde.
N. Caspers.
Oecologia (Berl). 19(2), p 171-175, 1975.

Descriptors: *Aquatic microorganisms, *Benthic flora, *Oxidation-reduction potential, *Aerobic conditions, *Variability, Biological communities, Scavengers, Water requirements, Ponds, Shores.
Identifiers: *Macrophytes, Alisma plantago aquatica, Alopecurus aequalis, Bonn, *Caloric content, Equisetum fluviatile, Glyceria fluitans, Juncus effusus, Lycopus europaeus, Lysimachia vulgaris, Mentha aquatica, Myosotis palustris, Polygonum hydropiper, Sparganium erectum, West Germany, *Ash content.

In Aug. 1973 and Aug. 1974, 11 macrophytes (Alisma plantago-aquatica, Alopecurus aequalis, Lycopus europaeus, Polygonum hydropiper, Myosotis palustris, Equisetum fluvatile, Glyceria fluitans, Juncus effusus, Lysimachia vulgaris, Mentha aquatica, Sparganium erectum) of a pond-shore community near Bonn (West Germany) were investigated with regard to caloric values and ash content and the variability of these parameters. Due to the high constancy of the most important factor, 'availability of water', caloric values varied over rather narrow ranges or did not change at all. Mean values of the caloric determinations were obtained (4157.7 and 4161.2 cal/g dry weight; 4601.2 and 4606.1 cal/g ash-free dry weight) and compared with the data provided by other authors. In L. vulgaris L., intraspecific variations of the caloric values were determined according to the combustion of flowers, fruits, leaves, and stems.--Copyright 1975, Biological Abstracts, Inc.
W77-02336

ALGAL METABOLITE INFLUENCE ON BLOOM SEQUENCE IN EUTROPHIED FRESHWATER PONDS,
Haskins Labs., Inc., New Haven, Conn. Orsborn Memorial Lab.
For primary bibliographic entry see Field 5C.
W77-02438

PHOSPHATE REDUCTION AND RESPONSE OF PLANKTON POPULATIONS IN KOOTENAY LAKE,
Washington State Univ., Pullman.
For primary bibliographic entry see Field 5C.
W77-02440

STUDIES ON LAKE RESTORATION BY PHOSPHORUS INACTIVATION,
Corvallis Environmental Research Lab., Oregon.
For primary bibliographic entry see Field 5G.
W77-02442

MATHEMATICAL MODELING OF PHYTOPLANKTON IN LAKE ONTARIO. PART 2. SIMULATIONS USING LAKE 1 MODEL,
Manhattan Coll., Bronx, N. Y. Environmental Engineering and Science Program.
For primary bibliographic entry see Field 5C.
W77-02443

WATER FLOW IN GLACIERS: JOKULHLAUPS, TUNNELS AND VEINS,
Bristol Univ. (England). H. H. Wills Physics Lab.
For primary bibliographic entry see Field 2C.
W77-02458

AUTOMATED SEISMIC MONITORING SYSTEM FOR LAKE MICHIGAN ICE STUDIES,
Wisconsin Univ., Milwaukee. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2C.
W77-02468

LARGE-SCALE CURRENT MEASUREMENTS IN LAKE HURON,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
P. W. Sloss, and J. H. Saylor.
Journal of Geophysical Research, Vol 81, No 18, p 3069-3078, June 20, 1976. 7 fig, 12 ref.

Descriptors: *Water circulation, *Currents(Water), *Lake Huron, *Great Lakes, Current meters, Lakes, Circulation, Measurement, Temperature, Water temperature, Winds, Weather, Flow, Depth, Limnology.
Identifiers: Oscillatory currents.

Reanalysis of the data from the 1966 Great Lakes-Illinois River Basin Project (GLIRBP) of the Federal Water Pollution Control Administration (FWPCA) revealed some of the large-scale persistent summertime circulation patterns in Lake Huron. The greatest density of data from the original 45 current meter moorings covers June-August 1966, when some 21 stations returned synoptically significant data from current meters at depths of 10 and 15 m. From this somewhat sparse sample, it was deduced that at 10-m depth a counterclockwise circulation dominates the northern two thirds of the lake. The shallower southern portion shows a more complex pattern, with generally southward flow along the shorelines on both sides and a return flow northward near the center line of the southern basin. This latter pattern may decay later in the summer, but the data become too patchy for definite analysis. The data set from 15-m depth indicated similar circulations. Spectral analysis of currents at individual stations reveals a strong inertial rotation of the current vector at open lake sites. Only the data from the Straits of Mackinac lack the inertial component and are dominated by the lunar semidiurnal tide and the seiches of Lake Michigan. (Sims-ISWS)
W77-02473

AN EVALUATION OF PARAMETERS FOR THE THEORETICAL DISTRIBUTION OF PERIODS AND AMPLITUDES OF SEA WAVES,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
P. C. Liu.
Journal of Geophysical Research, Vol. 81, No. 18, p 3161-3162, June 20, 1976. 1 fig, 4 ref.

Descriptors: *Waves(Water), *Great Lakes, *Model studies, Mathematical models, Evaluation, Winds, Fetch, Energy, Frequency, Limnology, Equations.
Identifiers: Wave periods, Wave amplitudes.

Parameters used in characterizing the theoretical joint distribution of the periods and amplitudes of sea waves were evaluated in connection with an empirical, fetch-limited wave energy spectrum formula derived from wave data recorded in the Great Lakes. The results showed that the spectral width parameter obtained from the empirical formula justifies the narrow spectrum approximation used in the theoretical distributions. Further empirical data showed that the average wave periods calculated from an energy spectrum are quite close to those estimated from the statistical data. (Sims-ISWS)
W77-02479

SKYLAB STUDY OF WATER QUALITY,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 5A.
W77-02505

SOME EFFECTS OF THE ASWAN HIGH DAM ON WATER AND FISHES OF LAKE BORULLUS, A. R. E.,
Academy of Scientific Research and Technology, Cairo (Egypt).
For primary bibliographic entry see Field 5C.
W77-02512

SEASONAL VARIATIONS OF TEMPERATURE AND NUTRIENTS IN THE SURFACE WATERS OF LAKES ONTARIO AND ERIE,
Eidgenoessische Anstalt fuer Wasservorsorgung, Abwasserreinigung und Gewaesserschutz, Kastienbaum (Switerzerland). Hydrobiology Lab.
For primary bibliographic entry see Field 5C.
W77-02515

THE EUTROPHICATION IMPLICATIONS OF INTERACTIONS BETWEEN NATURALLY OCCURRING PARTICULATES AND METHANE OXIDIZING BACTERIA,
Ohio State Univ., Columbus. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-02536

2I. Water In Plants

MAXIMIZING STOMATAL CONTROL AND ROOT SYSTEM TO OPTIMIZE WATER-USE EFFICIENCY IN SOYBEANS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 3F.
W77-02077

VEGETATION AND SOIL OF SALINE DEPRESSIONS NEAR NAJAF, CENTRAL IRAQ,
Baghdad Univ., (Iraq). Dept. of Botany.
For primary bibliographic entry see Field 3C.
W77-02116

WATER FLOW IN WHEAT SEEDLINGS AFTER SMALL WATER DEFICITS,
Lund Univ. (Sweden). Dept. of Plant Physiology.
For primary bibliographic entry see Field 2D.
W77-02172

COMPETITION AND SPACING IN PLANT COMMUNITIES: THE NORTHERN MOHAVE DESERT,
Pennsylvania State Univ., University Park. Dept. of Biology.
R. I. Yeaton, and M. L. Cody.
Journal of Ecology, Vol. 64, No. 2, p 689-696, July, 1976. 4 fig, 7 ref.

Descriptors: *Desert plants, *Plant growth, *Plant groupings, *Competing uses, Water supply, Biological communities, Water requirements, Root systems, Root development, Photosynthesis, Groundwater, Shrubs, Soil moisture, Arid lands, Deserts, Competition.
Identifiers: *Mohave Desert.

The arrangement of individual plants and their inter-relations in complex Mohave desert communities were examined. Three species were studied: Yucca schidigera, Opuntia acanthocarpa, and O. ramosissima. Desert plants compete for water, but are spaced far enough apart to eliminate effects of competition for sunlight. Distance measurements were made in the field, the size of each plant to be studied determined, and the photosynthetic surface area estimated. Results indicate that competition is occuring between the two species of Opuntia and that competition between Yucca and O. acanthocarpa, is as strong as that between the two Opuntia species. O. ramosissima tolerates O. acanthocarpa growing in closer proximity than a member of its own species. This suggests that interspecific differences occur in the structure or function of root systems. The plant community studied is composed of several species, each spaced out on the basis of size. The distribution patterns of each species are superimposed, subject to the following restraints: (1) no two individuals may occupy the same physical trunk space and (2) species which show interspecific competition must be spaced out in relation to the other species with some maximum degree of overlap tolerated. Results also show that it is not necessary to examine plants in pure stands to study competition and spacing. (Jamail-Arizona)
W77-02174

SODIUM RELATIONS IN DESERT PLANTS: 5. CATION BALANCE WHEN GROWN IN SOLUTION CULTURE AND IN THE FIELD IN THREE SPECIES OF LYCIUM FROM THE NORTHERN MOJAVE DESERT,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 3C.
W77-02178

BIBLIOGRAPHY OF SOVIET LITERATURE ON FRESHWATER HYDROBIOLOGY AND RELATED PROBLEMS: 1974-1975 (ISSUE 19), (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
A. V. Tropachevskii.
Gidrobiol Zh 11(5), p 126-136, 1975.

Descriptors: *Bibliographies, Algae, *Hydrobiology, Invertebrates, Freshwater, *Microbiology, Parasitism, Toxicity.
Identifiers: USSR.

A bibliography of Soviet works published in 1974-1975 on freshwater hydrobiology, sanitary hydrobiology, aquatic toxicology, physiology of algae, physiology of invertebrates, aquatic microbiology, geochemistry of surface waters and parasitology of freshwater invertebrates is presented.--Copyright 1976, Biological Abstracts, Inc.
W77-02232

PRESSING CHARACTERISTICS OF WATER-HYACINTH,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
J. Cifuentes, and L. O. Bagnall.
Journal of Aquatic Plant Management, Vol. 14, p 71-75, June, 1976. 8 fig, 1 tab, 11 ref. OWRT A-017-FLA(8). 14-31-0001-3809.

Descriptors: *Drying, Chemical analysis, Nutrients, Digestion, Aquatic weeds, *Water hyacinth, Rooted aquatic plants, Animal physiology, Toxins, Feeds, Aquatic plants, *Aquatic weed control.

Waterhyacinth (Eichhornia crassipes (Mart.) Solms) at 95% moisture content was pressed in cylinders with perforated liners. Parameters affecting radial flow of expressed juices were examined. Particle size reduction, particularly by shearing, and cake rotation within the press increased expression efficiency. Fluid expression decreased as cylinder radius increased and available drainage area decreased. Optimum compression time is about 40 seconds. Cake density is related to material pressure. (Morgan-Florida)
W77-02527

PATTERNS OF LEAF RESISTANCE TO LODGEPOLE PINE TRANSPIRATION IN WYOMING,
Wyoming Univ., Laramie. Dept. of Botany.
For primary bibliographic entry see Field 2D.
W77-02531

2J. Erosion and Sedimentation

A SUBMODEL FOR NITROGEN RELEASE FROM SEDIMENTS,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
For primary bibliographic entry see Field 5B.
W77-02099

SCOURING OF COHESIVE SOILS,
Howard Univ., Washington, D. C. Dept. of Civil Engineering.
E. O. Kuti, and C-L. Yen.

Journal of Hydraulic Research, Vol. 14, No. 3, p 195-206, 1976. 6 fig, 1 tab, 9 ref.

Descriptors: *Scour, *Cohesive soils, *Laboratory tests, *Void ratio, *Plasticity index, Spillways, Erosion, Chemical properties, Kaolinite, Equilibrium, Model studies, Flow.
Identifiers: *Incipient motion, Equilibrium scour.

The analysis of the scouring problem was approached from the concept of incipient motion of the soil particles. A model spillway was constructed, and experiments were performed on mixtures of sand and clay minerals beyond the hydraulic jump. The general factors affecting scouring of cohesive bed downstream of a spillway were shown to be flow characteristics, soil properties, fluid properties, and boundary conditions. When the rate of flow is finite, there is limit to the extent of scour. The volume of solids, excluding voids, scoured in each soil test at a known percentage of clay mineral was the same irrespective of the in-situ void ratio before scouring was initiated. A low void ratio increases the time to reach the equilibrium scour. As the clay percentage increases, it takes longer to reach the equilibrium stage. The percentage of clay minerals and plasticity index can be used as parameters of soil to give an indication of the resistance of soil to erosion only when the type of chemicals in the eroding fluid are known. Plasticity index will also be good to compare erodibility of two types of soils if other conditions are the same. (Singh-ISWS)
W77-02127

GEOMETRY OF RIPPLES AND DUNES IN ALLUVIAL CHANNELS,
Roorkee Univ. (India). Dept. of Civil Engineering.
K. G. R. Raju, and J. P. Soni.
Journal of Hydraulic Research, Vol. 14, No. 3, p 241-249, 1976. 5 fig, 1 tab, 19 ref.

Descriptors: *Dunes, *Waves(Water), *Alluvial channels, *Flow resistance, *Bed load, Channel morphology, Seiment transport, Analytical techniques, Shear drag, Porosity, Equations, Mathematical studies, Theoretical analysis.
Identifiers: *Bed form geometry, Experimental data, Functional relations.

The bed of an alluvial channel gets deformed into various shapes - resulting in highly varying form resistance - with changes in fluid, sediment, and flow characteristics. Ripples and dunes are the most predominant bed features in natural streams and artificial canals characterized by small slopes. Knowledge of the size of ripples and dunes will make the flow resistance problems tractable. A semi-theoretical approach to the prediction of the average height and length of ripples and dunes was presented. The height of the dune was shown to be related to bed load transport rate and the advance velocity of the dune. The relationships between pertinent parameters were developed with the use of practically all available experimental data. It was learned that the parameters which influence the average length of the dunes also influence the average length of the ripples. The relations for height and length of ripples and dunes were given in dimensionless form. (Singh-ISWS)
W77-02130

DISTRIBUTION OF CALCIUM CARBONATE IN SURFACE SEDIMENTS OF THE ATLANTIC OCEAN,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
For primary bibliographic entry see Field 2L.
W77-02133

DISTRIBUTION OF CARBONATE IN SURFACE SEDIMENTS OF THE PACIFIC OCEAN,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W77-02134

CONTROLLING EROSION AND SEDIMENTATION AT CONSTRUCTION SITES,
For primary bibliographic entry see Field 4D.
W77-02146

SEDIMENTATION RATES AND SEDIMENT THICKNESSES IN LAKE CHAMPLAIN: 1975-76,
Vermont Univ., Burlington. Dept. of Geology.
A. S. Hunt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 356, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, June 1976. 14 p, 5 fig, 2 ref. OWRT A-024-VT. (1). 14-34-0001-6047.

Descriptors: Sedimentation, *Lake sediments, *Sedimentation rates, Bedrock, Lakes, *Vermont, Bathymetry, Lake morphometry.
Identifiers: *Sediment thicknesses, *Lake Champlain(Vt).

Using geophysical techniques the thickness of sediments and shape of the bedrock basin have been studied in central Lake Champlain and compiled as sediment thickness and bedrock topography maps. Four major depressions have been recognized which correspond to maximum areas of sediment accumulation in which sediment thickness exceeds 700 feet. Maximum sedimentation rates in these areas are estimated to be 5 feet per hundred years. Sediment accumulation is most closely related to bedrock configuration rather than distance from shore or proximity to sediment source. With few exceptions the bedrock topography corresponds well with the present day bottom bathymetry.
W77-02193

GEOLOGIC AND PHYSICAL FACTORS AFFECTING LAKE CHAMPLAIN SHORELINE EROSION,
Vermont University, Burlington, Dept. of Geology.
A. S. Hunt, J. P. Olson, and C. R. Durham.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 506, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, June 1976. 20 p, 5 fig, 6 ref. OWRT A-026-VT(1). 14-34-0001-6047.

Descriptors: Erosion, Lakes, *Vermont, *Beach erosion, *Bank erosion, *Lake shores.
Identifiers: *Lake Champlain(Vt).

Profile sites from three characteristic geological settings were surveyed in the Fall of 1975 to permit study of the amount and nature of shoreline movement in Lake Champlain. Two of the sites were resurveyed after the record spring high lake level of 1976. Recession of the toe of the bank was observed in all areas and is attributed to wave action; top bank recession is attributed to slumping and gully wash. A maximum recession of 11 feet at the top of the bank and eight feet at the toe has been observed. Deposition, which occurred in the offshore profiles during high spring lake level, is believed to be a response to the non-equilibrium condition. Factors recognized as of primary importance in the natural control of shoreline erosion are adequate vegetative cover and good bank drainage.
W77-02222

A COMPARISON OF NITROGEN, PHOSPHORUS, AND CARBON IN SEDIMENTS AND SOILS OF CULTIVATED AND NONCULTIVATED WATERSHEDS IN THE NORTH CENTRAL STATES,
Agricultural Research Service, Oxford Miss.
For primary bibliographic entry see Field 5G.
W77-02292

SEDIMENT PROBLEMS IN THE SAVANNAH RIVER BASIN,
Geological Survey, Lakewood, Colo. Water Resources Div.
R. H. Meade.
In: The Future of the Savannah River; Proceedings of a Symposium held at Hickory Knob State Park, McCormick, South Carolina, October 14-15, 1975: Published by Water Resources Research Institute, Clemson University, Clemson, South Carolina. p 105-129, June 1976. 9 fig, 47 ref.

Descriptors: *Sediment transport, *Sedimentation, Sediment load, *Soil erosion, *Streamflow, Sediment yield, Sedimentology, Reservoirs, Alluvium, Estuaries, Topography, Data collections.
Identifiers: *Savannah River(Geo-SC), Piedmont, Fall line.

Sediment in the Savannah River (Georgia-South Carolina boundary) is derived mainly from the parts of the basin that lie above the fall line -- particularly the Piedmont province. Accelerated erosion has stripped some 3 to 4 billion cubic meters of sediment from the Piedmont uplands since 1700. However, more than 90 percent of this sediment has not been carried across the fall line by the river; it remains stored on the hill slopes and in the stream bottoms of the Piedmont. Large reservoirs trap most of the sediment moving down the main stem of the Savannah. The sediment that accumulates in the dredged navigation channels of the estuary is only partly attributable to upland sources; other sources remain to be identified. (Woodard-USGS)
W77-02320

RARE EARTH ELEMENT SUPPLY TO THE OCEAN,
Ecole Normale Superieure, Paris (France). Laboratoire de Geologie.
For primary bibliographic entry see Field 2L.
W77-02478

USE OF LANDSAT DATA FOR NATURAL RESOURCES INVESTIGATION IN THE LOWER BASIN OF DANUBE AND DANUBE DELTA,
Institutul de Constructii din Bucuresti (Rumania). Lab. for Remote Sensing.
For primary bibliographic entry see Field 2L.
W77-02503

2K. Chemical Processes

THE USE OF A SPECIFIC ION ELECTRODE FOR DETERMINATION OF BROMIDE IN SOILS,
Texas Engineering Experiment Station, College Station.
For primary bibliographic entry see Field 2G.
W77-02100

EFFECTS OF PHOSPHORUS ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF CLAYS,
West Pakistan Agricultural Univ., Lyallpur.
For primary bibliographic entry see Field 2G.
W77-02101

SULFUR FRACTIONS AND CARBON-NITROGEN-PHOSPHORUS-SULFUR RELATIONSHIPS IN SOME BRAZILIAN AND IOWA SOILS,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 2G.
W77-02102

EVALUATION OF THE RING OVEN TECHNIQUE FOR WATER MONITORING,
Atlantic Research Corp., Alexandria, Va.
For primary bibliographic entry see Field 5A.
W77-02148

EVALUATION OF THE RING OVEN TECHNIQUE FOR WATER MONITORING, APPENDICES,
Atlantic Research Corp., Alexandria, Va.
For primary bibliographic entry see Field 5A.
W77-02149

CONFIGURATION INTERACTION STUDIES OF THE EXCITED STATES OF WATER,
Aerospace Corp., El Segundo, Calif.
For primary bibliographic entry see Field 1A.
W77-02153

TRACE ELEMENTS IN SOILS OF THE DNIEPER-BUG LIMAN, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 2G.
W77-02258

EXTRACTION-PHOTOMETRIC DETERMINATION OF MERCURY IN SOIL AND WATER, (IN RUSSIAN),
Uzhgorod State Univ. (USSR).
For primary bibliographic entry see Field 5A.
W77-02272

NITROGEN FIXATION BY ALGAE IN FESCUEGRASS SOIL CRUSTS,
Georgia Univ., Athens. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-02274

RATE OF DISSOLUTION OF PHOSPHATE FROM MINERALS AND SOILS,
Montana State Univ., Bozeman. Dept. of Chemistry.
For primary bibliographic entry see Field 2G.
W77-02275

THE EFFECT OF AMMONIA AND AMMONIA-SULFUR SOLUTIONS ON NITRIFICATION RATES AND CHEMICAL PROPERTIES OF A CALCAREOUS SOIL,
Texas Tech Univ., Lubbock. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-02276

POTASSIUM-CALCIUM EXCHANGE EQUILIBRIA IN VOLCANIC-ASH SOILS,
Chile Univ., Santiago. Dept. of Chemistry.
For primary bibliographic entry see Field 2G.
W77-02277

FIXATION OF IRON AND ZINC APPLIED AS CHELATES INTO A SOIL COLUMN DURING LEACHING,
Hebrew Univ., Rehovoth (Israel). Dept. of Soil and Water Science.
For primary bibliographic entry see Field 2G.
W77-02280

DISSOLUTION OF ILLITE--A POSSIBLE MECHANISM OF POTASSIUM RELEASE,
Agricultural Research Organization, Bet-Dagan (Israel). Inst. of Soils and Water.
For primary bibliographic entry see Field 2G.
W77-02283

ENVIRONMENTAL IMPLICATIONS OF N FIXATION BY SOYBEANS,
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
For primary bibliographic entry see Field 3C.
W77-02289

POTASSIUM IN AN ARID LOESSIAL SOIL: CHARACTERIZATION BY EQUILIBRIUM RELEASE-ABSORPTION TO STRONG SALT SOLUTIONS,
Washington State Univ., Pullman. Coll. of Agriculture Research Center.
For primary bibliographic entry see Field 2G.
W77-02296

DESCRIPTIONS AND CHEMICAL ANALYSES FOR SELECTED WELLS IN THE CENTRAL SACRAMENTO VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
R. P. Fogelman.
Open-file report 76-472, July 1976. 71 p, 3 fig, 33 maps, 4 tab.

Descriptors: *Groundwater resources, *Water wells, *Well data, *Water quality, *California, Water utilization, Water yield, Water levels, Drawdown, Chemical analysis, Basic data collections, Sampling.
Identifiers: *Central Sacramento Valley(Calif).

The Sacramento Valley occupies the northern one-third of the Great Central Valley of California. The study area of this report includes about 1,200 square miles (3,100 square kilometers) adjacent to the Sacramento River from Knights Landing to Los Molinos, in parts of Yolo, Sutter, Colusa, Glenn, Butte, and Tehama Counties. Between April and August 1975, 559 wells were canvassed, and during September and October 1975, water samples were collected for chemical analysis from 209 of these wells. Field determinations of alkalinity, conductance, pH, and temperature were made on the site at the time of sampling. Samples were prepared in the field for shipment and analysis for individual constituents at the Geological Survey Central Laboratory, Salt Lake City, Utah. Descriptive data for water wells are listed, chemical data are tabulated, and the location of wells is shown on maps. (Woodard-USGS)
W77-02299

RECONNAISSANCE OF GROUND-WATER RESOURCES OF THE SQUAXIN ISLAND INDIAN RESERVATION, WASHINGTON,
Geological Survey, Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-02308

WATER-QUALITY STUDY OF A REACH OF THE MERCED RIVER IN YOSEMITE NATIONAL PARK AND VICINITY, CALIFORNIA--APRIL 1973 THROUGH SEPTEMBER 1974,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-02309

THE MERIDIAN-UPPER WILCOX AQUIFER IN MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-02310

MAPS SHOWING GROUND-WATER CONDITIONS IN THE LOWER BIG CHINO VALLEY AND WILLIAMSON VALLEY AREAS, YAVAPAI AND COCONINO COUNTIES, ARIZONA,
Geological Survey, Tucson, Ariz. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-02312

A BIVARIATE-REGRESSION MODEL FOR ESTIMATING CHEMICAL COMPOSITION OF STREAMFLOW OR GROUNDWATER,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-02317

GROUND-WATER RESOURCES AND GEOLOGY OF ST. CROIX COUNTY, WISCONSIN,
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-02321

GROUND-WATER HYDROLOGY OF THE COCOA WELL-FIELD AREA, ORANGE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-02323

SILVER CONTENT OF PRECIPITATION FROM SEEDED AND NONSEEDED FLORIDA CUMULI,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
J. Wisniewski, W. R. Cotton, and R. I. Sax.
Journal of Applied Meteorology, Vol. 15, No. 9, p 1004-1011, September 1976. 4 fig, 4 tab, 13 ref.

Descriptors: *Silver iodide, *Rainfall, *Florida, Measurement, Chemical analysis, Aircraft, Sampling, Precipitation(Atmospheric), Storms, Chemistry, Chemistry of precipitation, Cloud seeding, Pollutants, Water pollution sources, Meteorology.
Identifiers: *Silver.

A subprogram of NOAA's 1973 Florida Area Cumulus Experiment (FACE) was undertaken to determine the silver content of precipitation associated with convective clouds massively seeded with silver iodide nucleant over southern Florida. An atomic absorption analysis of 127 rainwater samples collected just below cloud base by a polypropylene-lined scoop mounted on the fuselage of the NOAA DC-6 aircraft indicated that the mean concentration of silver obtained on seed days (69 samples) was no greater (and, in fact, appreciably less) than that obtained on no-seed days (58 samples). In both sets of samples, the median concentration of silver was more than two orders of magnitude lower than the U.S. Public Health safety limit of 5 X 10 to the -8th power g/ml. Of the 69 aircraft samples collected on seed days, only two contained a concentration of silver in excess of 1 X 10 to the -9th power g/ml. Of the 58 aircraft samples collected on no-seed days, eight contained silver in concentrations exceeding 1 X 10 to the -9th power g/ml. The samples collected from the aircraft showed higher mean concentrations of silver than did those collected on the ground. An atomic absorption analysis of 79 rainwater samples collected at both fixed and mobile sites on the surface showed that the mean concentration of silver on seed days was three orders of magnitude less than 5 X 10 to the -8th power g/ml; the maximum concentration of silver found in any sample did not exceed 1 X 10 to the -9th power g/ml. Statistical results from the nonparametric Mann-Whitney Wilcoxon test suggest that the surface seeded (34 samples) and surface nonseeded (45 samples) data come from the same population (i.e., no significant differences between the two data sets). There is some evidence (from a separate set

of surface rainwater samples collected upwind of the target area) to suggest a persistently higher (by about a factor of 2 or 3) mean concentration of silver during the course of the experiment than either before of after the experiment. (Sims-ISWS)
W77-02485

MOLECULAR STUDIES OF THE ICE-FORMING CAPABILITIES OF DIFFERENT SURFACES,
Gidrometeorologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 3B.
W77-02487

ELECTRODE KINETICS OF ANTIMONY IN ACIDIC CHLORIDE SOLUTIONS,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 3A.
W77-02533

DETERMINATION OF SURFACE EQUILIBRIA AND MASS TRANSFER RATES IN A CONCURRENT FLOW BUBBLE COLUMN,
California Univ., Berkeley. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 3A.
W77-02535

MODIFICATION OF A COMMERCIAL SPECTROFLUOROMETER FOR RAPID DETERMINATION OF NEAR INFRARED EMISSION,
Auburn Univ., Ala. Charles Richard Saunders Chemical Lab.
W. C. Neely, T. D. Hall, S. Cravitt, and J. H. DeLap.
Applied Spectroscopy, Vol. 29, No. 2, p. 205-206, March-April 1975, 4 fig, 3 ref. OWRT A-035-ALA(8).

Descriptors: Ultraviolet radiation, Instrumentation, Analytical techniques, Spectrophotometry, *Spectrometers, *Fluorometry.
Identifiers: Near infrared emission, Luminescence, Wavelength adapter, *Spectrafluorometers, Phosphorescence.

A simple method is described for extending the spectral region of the Farrand spectrofluorometer Mark I. The wavelength adapter is inexpensive and can be inserted rapidly. A Hamamatsu R-446 photomultiplier tube (PMT) in conjunction with the wavelength adapter extends the spectral region to 900 nm. The fluorescence and phosphorescence spectra of Victoria Blue B in ethanol were obtained in this extended region.
W77-02537

CALCIUM EQUILIBRIUM IN MIXED ION AQUEOUS SYSTEMS OPEN TO THE ATMOSPHERE,
New Mexico State Univ., Las Cruces. Dept. of Agronomy.
G. A. O'Connor, and C. F. Cadena.
Soil Science, Vol. 120, No. 3, p 182-187, 1975. 4 fig., 3 tab., 20 ref. OWRT A-048-NMEX(2).

Descriptors: *Calcite, *Calcium carbonate, *Aqueous solutions, *Equilibrium, Chemical properties, Thermodynamic behavior, Ions.
Identifiers: Ion pairs, Activity coefficients, Partial pressure of CO2.

Calcite solubility is of major importance to geologists and soil scientists, and yet attempts to characterize the system in terms of basic chemical relationships have met with limited success. The model reported herein adequately describes calcite equilibria in aqueous solutions open to the air that have practical significance to both geologists and soil scientists. Equations accounting for activity coefficients and various ion pair formations were sufficient to describe calcite equilibrium in solutions of widely varying ionic characteristics. Sixty out of 73 solutions selected from the literature yielded calculated Kisp values for calcite ranging from 2.6 to 4.0 X 10-9 with an average of 3.3 X 10-9. (Hain-New Mexico State)
W77-02538

2L. Estuaries

EVALUATION OF ESTUARINE SITE DEVELOPMENT LAGOONS,
Cook Coll., New Brunswick, N.J.
For primary bibliographic entry see Field 5G.
W77-02088

ON THE RELIABILITY OF THE SPECTRAL METHOD FOR THE DESIGN OF OFFSHORE STRUCTURES,
Technische Universitaet, Munich (West Germany). Institut fuer Bauinzenieurwesen III.
For primary bibliographic entry see Field 8B.
W77-02129

A MIXED-DIMENSION KINEMATIC ESTUARINE MODEL,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
A. J. Elliott.
Chesapeake Science, Vol. 17, No. 3, p 135-140, September 1976. 7 fig, 5 ref, 1 append.

Descriptors: *Estuaries, *Model studies, *Salinity, *Potomac River, Salt balance, Spring, Equations, Mathematical models, Mixing, Water circulation, Water quality, Biology, Fish, Path of pollutants.

A kinematic model, developed for use during conditions of low salinity when the upper reaches of an estuary are vertically mixed, divides the estuary into one- and two-dimensional regimes. The model was applied to the Potomac by assuming that the estuary is one-dimensional above Maryland Point and two-dimensional seaward of Morgantown. The model appears to reproduce features of estuarine mixing, especially during the spring conditions of low salinity. Such a model may have application to biological problems which involve the transport of fish eggs and larvae. (Humphreys-ISWS)
W77-02131

THE CIRCULATION AND SALINITY DISTRIBUTION OF THE UPPER POTOMAC ESTUARY,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
A. J. Elliott.
Chesapeake Science, Vol. 17, No. 3, p 141-147, September 1976. 8 fig, 3 tab, 6 ref.

Descriptors: *Potomac River, *Circulation, Flow, Profiles, Salinity, Currents, Shear, Return flow, Estuaries, Monthly, Path of pollutants.
Identifiers: *Upper Potomac estuary, *Circulation distribution, *Maryland point, Current data, Salinity distribution, Internal circulation, Reverse flow, Vertical shear.

Salinity and current data from the Upper Potomac estuary were analyzed to determine the intensity of the internal circulation. One set of data, collected during the fall of 1973, suggested that a reverse flow existed as far upstream as Maryland Point. Data taken during other periods indicated that an estuarine circulation, with a reverse flow in the lower layer, was not well developed above Morgantown. However, the net seaward flow did decrease significantly with depth at all stations below Douglas Point and caused vertical shear in the mean profiles. Although there was no direct observational evidence from the measurements, it seemed possible that a return flow existed close to the bottom at some of the stations. Using a 4/3's law, the horizontal eddy diffusivity was estimated to be of the order of 2,000,000/s during April 1974. (Roberts-ISWS)
W77-02132

DISTRIBUTION OF CALCIUM CARBONATE IN SURFACE SEDIMENTS OF THE ATLANTIC OCEAN,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
P. E. Biscaye, V. Kolla, and K. K. Turekian.
Journal of Geophysical Research, Vol. 81, No. 15, p 2595-2603, May 20, 1976. 6 fig, 1 tab, 29 ref. NSF IDO-74-04204, NSF IDO-75-19627.

Descriptors: *Sediments, *Calcium carbonate, *Atlantic Ocean, Surveys, Measurement, Mapping, Distribution, Distribution patterns, Sediment distribution, Spatial distribution, Bathymetry, Depth, Oceans, Chemicals, Carbonates, Calcium compounds, Detritus, Sedimentology, Oceanography.
Identifiers: *Calcium carbonate distribution, Surface sediments.

The areal distribution of calcium carbonate in the surface sediments of the Atlantic Ocean and adjacent seas and oceans was mapped on the basis of over 1700 data points. The following conditions were found to exist: The first-order relation of carbonate distribution to water depth is evident in both the areal distribution and the plots of carbonate versus depth for 11 areas of the Atlantic. Superimposed on this relation are significant variations in both the 100% and the 0% CaC03 depth intercepts, analogous to the (calcite) lysocline and the (calcite) carbonate compensation depth, respectively. Variations in these critical parameters between the 11 areas were related to the three rate processes which control carbonate distributions: surface productivity, dissolution, and dilution by noncarbonate biogenic and nonbiogenic sediment. The areal distribution of carbonate in surface sediments was compared with that in sediments deposited at the end of the last glacial epoch, 18,000 yr B.P., when carbonate abundance was markedly lower. (Sims-ISWS)
W77-02133

DISTRIBUTION OF CARBONATE IN SURFACE SEDIMENTS OF THE PACIFIC OCEAN,
Scripps Institution of Oceanography, La Jolla, Calif.
W. H. Berger, C. G. Adelseck, Jr., and L. A. Mayer.
Journal of Geophysical Research, Vol. 81, No. 15, p 2617-2627, May 20, 1976. 12 fig, 77 ref. NSF GA-41078, ONR N00014-69-A-0200-6049.

Descriptors: *Sediments, *Calcium carbonate, *Pacific Ocean, Mapping, Distribution patterns, Sediment distribution, Spatial distribution, Bathymetry, Depth, Oceans, Chemicals, Carbonates, Calcite, Calcium compounds, Detritus, Recent epoch, Sedimentology, Oceanography.
Identifiers: *Calcium carbonate distribution, Surface sediments.

The distribution of carbonate on the floor of the Pacific was remapped on the basis of 1313 points from 80 references stored in the World Ocean Sediment Data Bank of Scripps Institution of Oceanography. Percent distribution maps and carbonate versus depth diagrams generally agreed with previously published information and reflected the major controlling factors of carbonate sedimentation (depth, hydrography, fertility, and sedimentary processes). While carbonate distributions are of limited use in attempting to construct dissolution profiles, major trends were identifiable. In particular, the degree of lowering of the equatorial calcite compensation depth (CCD) together with an estimate of the differences in supply rates between the equator and the sub-

tropical gyre can be used to estimate dissolution rate increase below the lysocline. There was considerable variation in the sharpness of the 'CCD transition,' a concept defined here. This variation was thought to reflect both geographic differences in dissolution rate gradients and redeposition processes (carbonate, deep-sea sediments, calcite, and compensation depth). (Sims-ISWS)
W77-02134

MEASUREMENTS OF THE TURBULENT BOUNDARY LAYER UNDER PACK ICE,
Washington Univ., Seattle. Dept of Geophysics.
For primary bibliographic entry see Field 2C.
W77-02138

TRACKING A GULF STREAM RING WITH SOFAR FLOATS,
Naval Oceanographic Office, Washington, D.C.
R. E. Cheney, W. H. Gemmill, M. K. Shank, P. L. Richardson, and D. Webb.
Journal of Physical Oceanography, Vol. 6, No. 5, p 741-749, September 1976. 9 fig, 2 tab, 16 ref. ONR NR 083-328, NSF 10075-08765.

Descriptors: *Oceans, *Ocean circulation, *Eddies, *Atlantic Ocean, On-site investigations, Circulation, Water circulation, Floats, Buoys, Movement, Currents(Water), Ocean currents, Tracking techniques, Oceanography.
Identifiers: *Gulf Stream, *Gulf Stream rings, *Sargasso Sea.

An experiment to test the feasibility of tracking Gulf Stream rings with neutrally buoyant SOFAR floats was begun in September 1974. Three floats were launched at depths of 750, 1050, and 1080 m in a ring west of Bermuda. One float left the ring after 3 weeks. The other two floats remained in the ring for 2-3 months while it moved 375 km westward at a rate of 6 cm/s; they were subsequently entrained by the Gulf Stream off Cape Hatteras. A second ring seeded with floats coalesced with the Gulf Stream, and five of its six floats were carried eastward in the Stream. The sixth float drifted south out of the ring and into the Sargasso Sea. One float was launched in the Sargasso between the two rings; its net drift over a 6-month period was to the west at 1.1 cm/s. These results indicated that there is considerable exchange of water between a ring and surrounding water at depths of 750 to 1100 m and that rings can be tracked for periods of only a few months with SOFAR floats at these depths. Paths of the three floats tracked in the northwestern Sargasso Sea outside of rings and the Stream indicated a net westward drift approximately equal to the observed westward movement of rings in this region. (Sims-ISWS)
W77-02139

GULF STREAM KINEMATICS INFERRED FROM A SATELLITE-TRACKED DRIFTER,
Texas A and M Univ., College Station. Dept. of Oceanography.
A. D. Kirwan, Jr, G. McNally, and J. Coehlo.
Journal of Physical Oceanography, Vol. 6, No. 5, p 750-755, September 1976. 5 fig, 11 ref. ONR N00014-75-C-0537.

Descriptors: *Oceans, *Ocean circulation, *Atlantic Ocean, Floats, Buoys, Satellites(Artificial), Circulation, Water circulation, Currents(Water), Ocean currents, Tracking techniques, Velocity, Energy, On-site investigations, Drift bottles, Oceanography, Remote sensing.
Identifiers: *Gulf Stream, Kinetic energy, Kinematics, Acceleration.

A drifter was deployed in the Gulf Stream and tracked for 5 months by the Nimbus 6 satellite. From this experiment the technical capability of the satellite fixing system was assessed for measuring ocean currents, the drifter trajectory as it relates to the Gulf Stream position as determined by other independent means, and the kinematics and accelerations following the Stream axis. It was shown that the trajectory agrees quite well with the other data on the location of the Gulf Stream. The velocities, accelerations and kinetic energies derived from the trajectory were compared with previous studies. A comparison was made of the kinetic energy of the Gulf Stream as inferred from the drifter with some recent calculations made from ship drift. (Sims-ISWS)
W77-02140

DISTRIBUTION OF SALINITY AND TEMPERATURE IN THE HUDSON ESTUARY,
City Univ., of New York. Inst. of Marine and Atmospheric Sciences.
E. S. Posmentier, and J. W. Rachlin.
Journal of Physical Oceanography, Vol. 6, No. 5, p 775-777, September 1976. 2 fig, 7 ref.

Descriptors: *Salinity, *Temperature, *Estuaries, Mixing, On-site investigations, Measurement, Surveys, Distribution patterns, Spatial distribution, Circulation, Water circulation, Hudson River, *New York.
Identifiers: *Temperature-salinity relationships, *Hudson River estuary.

Vertical salinity profiles in the Hudson Estuary are extremely variable and often contain finestructure similar to that in oceanic stratification. This finestructure may be caused by the stability-dependent vertical diffusion of salt. The interpretation of T-S diagrams indicated that, to a first order, temperature and salinity are controlled by conservative mixing processes and that residence time in the Estuary is approximately one or two weeks. (Sims-ISWS)
W77-02141

OXYGEN IN A TIDAL RIVER: LOW TIDE CONCENTRATION CORRELATES LINEARLY WITH LOCATION,
North Carolina Univ. at Chapel Hill. Marine Sciences Program.
D. Frakenberg.
Estuarine and Coastal Marine Science, Vol. 4, No. 4, p 455-460, July 1976. 3 fig, 15 ref. NSF GA23488, GA34793.

Descriptors: *Dissolved oxygen, *Estuaries, *Georgia, *Tidal streams, Intertidal areas, Estuarine environment, Lagoons, Tidal waters, Tidal effects, On-site investigations, Surveys, Oxygen, *Path of pollutants.
Identifiers: *Duplin River(Ga), Low tide.

A two-year survey of dissolved oxygen distribution in the Duplin River, Georgia, was initiated in December 1971. The Duplin is a 12 km lagoon-type tidal river draining about 1142 hectares of salt marshes along the western edge of Sapelo Island, Georgia. It is a typical lagoon-type tidal river, i.e. and elongate, dendritic watercourse, parallel to shore and separated from the ocean by a barrier island. The circulation is dominated by tidal currents; but, since the lagoon ends blindly in surrounding salt marshes, it has no significant source of upland drainage, and its waters are rarely diluted measurably by freshwater from land runoff. Low tide dissolved oxygen concentration correlates with location along the course of the Duplin River. Concentration generally decreases with distance upstream, although the reverse situation also occurs. The relationship is linear and can be used predictively. The influence on this relationship of tidal circulation, in situ oxygen consumption and production, and rainfall was discussed. (Humphreys-ISWS)
W77-02145

A COMPARISON OF LUMPED-PARAMETER AND DIFFUSIONAL MODELS DESCRIBING THE EFFECTS OF THE OUTLET BOUNDARY CONDITIONS ON THE MIXING IN FLOW SYSTEMS,
City Coll., New York. Dept. of Chemical Engineering.
Y. Zivrin, and R. Shinnar.
Water Research, Vol 10, No 9, p 765-779, 1976. 12 fig, 2 tab, 21 ref, 2 append.

Descriptors: *Model studies, *Estuaries, *Dispersion, Mixing, Coasts, Outlets, Mass transfer, Diffusion, Flow, Mathematical models, Equations, Tidal effects, Inlets(Waterways), Flow system.
Identifiers: Diffusional model, Lumped-parameter model.

A comparison was presented between two methods of modeling the dispersion and mixing processes in large (geophysical) turbulent flow systems such as estuaries, coastal waters, and atmospheric systems. One method was based on the diffusional model, and the other was a lumped-parameter model referred to as 'box-model' or compartmental model. The models were compared on the basis of model free parameters defined here: the purging rate and remaining life distribution. It was found that there exists a good agreement between the results of both models for a one-dimensional system. The problem of the boundary condition at the outlet was discussed; it was concluded that the use of a mass transfer coefficient may be justified in some cases where inflows at the outlet (e.g., due to tidal motion) can be estimated. When these inflows are strong, a sink at the outlet can be taken as a boundary condition. (Humphreys-ISWS)
W77-02147

SWIMMING OF SLENDER FISH IN A NON-UNIFORM VELOCITY FIELD,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
J. N. Newman.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A021 564, Price codes: A02 in paper copy, A01 in microfiche. Reprint from the Journal of the Australian Mathematical Society, Vol. 19 (Series B), Part 1, p 95-111, 1975. 3 fig, 12 ref. ONR N00014-67-A-0204-0023, NSF GK-43886X.

Descriptors: *Fish, *Swimming, *Model studies, *Mathematical models, Mathematics, Velocity, Waves(Water), Hydrodynamics, Fish behavior, Oceans, Aquatic life.
Identifiers: *Fish hydrodynamics, Slender body theory, Porpoises.

The hydrodynamic pressure forces acting upon a slender fish were derived for the case of a fish swimming in a non-uniform velocity field. Possible applications are the effects on fish propulsion of swimming in waves, in turbulent eddies, and in the presence of other fish or a moving ship. The fish was assumed to be a slender body, with no vorticity shed into the fluid except at a single abrupt trailing edge located at the posterior end of the fish, and to be performing small lateral swimming undulations of its body. The non-uniform field through which the fish swims was assumed to be irrotational, and this field as well as the body undulations must be slowly-varying on the length-scale of the lateral fish dimensions. Expressions were derived for the local force and the time-averaged total thrust force. These were applied to the study of steady-state bow-riding and wave-riding of porpoises. (Sims-ISWS)
W77-02155

FOURTH SEMIANNUAL INTERAGENCY BRIEFING, FEBRUARY 1975, WASHINGTON, D.C.,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 8G.
W77-02158

THEORETICAL MONOCHROMATIC-WAVE-INDUCED CURRENTS IN INTERMEDIATE WATER WITH VISCOSITY AND NONZERO MASS TRANSPORT,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
T. A. Talay.
Report NASA TM X-3312, December 1975. 27 p, 5 fig, 12 ref, 1 append.

Descriptors: *Model studies, *Currents(Water), *Waves(Water), *Water circulation, Mathematical models, Mass transfer, Oceans, Continental shelf, Velocity, Circulation, Boundary layers, Equations, Oceanography.
Identifiers: *Wave-induced mass-transport currents.

Some wave-induced mass-transport current theories with both zero and nonzero net mass (or volume) transport of the water column are reviewed. A relationship based on the Longuet-Higgens theory was derived for wave-induced, nonzero mass-transport currents in intermediate water depths for a viscous fluid. The relationship was in a form useful for experimental applications; therefore, some design criteria for experimental wave-tank tests were also presented. Sample parametric cases for typical wave-tank conditions and a typical ocean swell were assessed by using the relation in conjunction with an equation developed by Uniuata and Mei for the maximum wave-induced volume transport. Calculations indicated that substantial changes in the wave-induced mass-transport current profiles may exist dependent upon the assumed net volume transport. A maximum volume transport, corresponding to an infinite channel or idealized ocean condition, produced the largest wave-induced mass-transport currents. These calculations suggested that wave-induced mass-transport currents may have considerable effects on pollution and suspended-sediments transport as well as buoy drift, the surface and midlayer water-column currents caused by waves increasing with increasing net volume transports. Some of these effects were discussed. (Sims-ISWS)
W77-02159

THE AQUACULTURE OF FRESH WATER PRAWNS, MACROBRACHIUM SPECIES,
Oceanic Inst., Waimanalo, Hawaii.
For primary bibliographic entry see Field 3E.
W77-02209

FATE AND EFFECTS OF OIL POLLUTANTS IN EXTREMELY COLD MARINE ENVIRONMENTS,
Louisville Univ., Ky.
For primary bibliographic entry see Field 5C.
W77-02210

EXCHANGE OF NUTRIENTS AND TRACE METALS BETWEEN MARSH SEDIMENTS AND ESTUARINE WATERS - A FIELD STUDY,
Clemson Univ., S. C. Dept. of Chemistry and Geology.
For primary bibliographic entry see Field 5B.
W77-02217

MAINE RIVERS BIBLIOGRAPHY- A USER'S MANUAL,
Research Inst. of the Gulf of Maine, Portland.
For primary bibliographic entry see Field 10C.
W77-02224

THE MERCURY CONTENT OF MOLLUSKS IN THE PONTEVEDRA ESTUARY AS A MEASURE OF ITS DEGREE OF MERCURY CONTAMINATION, (IN SPANISH),
Institut Espanol de Oceanografia, Madrid (Spain). Central Labs.
For primary bibliographic entry see Field 5A.
W77-02226

REACTIONS OF WHITE SEA ORGANISMS TO A DECREASE OF SALINITY IN CONNECTION WITH FRESHWATER DISCHARGE INTO BAYS, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
V. V. Khlebovich.
Gidrobiol Zh 11(5), p 88-91, 1975.

Descriptors: *Salinity, *Bays, Aquatic animals, Migration, Reproduction, Oceans, Freshwater, *Saline water-freshwater interfaces.
Identifiers: *White Sea(USSR).

Recommendations are given relative to the discharge of fresh water into the sea to minimize the adverse effects on the marine fauna. Large masses of fresh water should be discharged at the initial phase of the ebb tide; the layer of fresh water should not be greater than the height of the tide range, which precludes its effect on sublittoral stenohaline organisms. Considerable masses of fresh water in the littoral should be avoided since a lethal effect can occur at 5-8% salinity. There is a particular danger in the discharge of large masses of fresh water during intense reproduction of boreal species. Discharge of water should begin gradually to avoid shock in animals that migrate.--Copyright 1976, Biological Abstracts, Inc.
W77-02233

INFLUENCE OF MERCURY, LEAD, CADMIUM AND COPPER ON PRIMARY PRODUCTION AND PHYTOPLANKTON IN SOME COASTAL AREAS OF THE MEDITERRANEAN AND RED SEAS, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W77-02249

ANALGOLOGICAL SURVEY OF THE SONDELEDFJORD NEAR RISOR, S. NORWAY: A 'LAND-LOCKED' FJORD EXPOSED TO POLLUTION, (IN NORWEGIAN),
Oslo Univ. (Norway). Inst. of Zoology.
For primary bibliographic entry see Field 5B.
W77-02252

EFFECT OF SALINIZATION ON HYDROMACROPHYTES OF THE KUBAN ESTUARIES, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
A. G. Shekhov.
Ekologiya 5(5), p 62-67, 1974.

Descriptors: *Salinity, *Estuaries, Vegetation, Aquatic plants, Europe, Sea water, *Halophytes.
Identifiers: *Chara, Kuban, Macrophytes, *Myriophyllum, Phytomass, *Potamogeton-pectinatus, Russian-SFSR, USSR, Euryhalines, Glycophiles, *Kuban estuaries(USSR).

In 1969-1970 changes in the vegetation of the Gorki estuaries of the Kuban estuaries (Russian SFSR, USSR) due to salinization were studied. During the summer they were pumped out and filled with seawater. The species composition of the vegetation was greatly impoverished, decreasing from 27-7 spp. with the elimination of all glycophiles, the preservation of only the euryhalines and the appearance of a halophyte. The composition, structure, area and projective cover of the phytocenosis was altered and the yield of the aboveground phytomass of the aquatic plants was greatly reduced. As a result, the types of emergent vegetation of these estuaries changed from Potomageton pectinatus-Myriophyllum-Chara, into Myriophyllum-P. pectinatus.--Copyright 1976, Biological Abstracts, Inc.
W77-02255

NITROGEN LOSSES FROM SOILS OF THE NORTH CAROLINA COASTAL PLAIN,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W77-02294

THE DISTRIBUTION OF TWO MOSQUITO LARVIVOROUS FISHES, GAMBUSIA AFFINIS AND ORYZIAS LATIPES, IN THE TOKYO METROPOLITAN AREA, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Parasitology.
For primary bibliographic entry see Field 5G.
W77-02297

POTENTIAL FOR DEVELOPMENT OF GROUND WATER AT A TEST SITE NEAR TRURO, MASSACHUSETTS,
Geological Survey, Boston, Mass. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-02306

EFFECTS OF WATER MANAGEMENT ON FRESH-WATER DISCHARGE TO BISCAYNE BAY,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-02314

SEDIMENT PROBLEMS IN THE SAVANNAH RIVER BASIN,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 2J.
W77-02320

MODELING COLIFORM-BACTERIA CONCENTRATIONS AND PH IN THE SALT-WEDGE REACH OF THE DUWAMISH RIVER ESTUARY, KING COUNTY, WASHINGTON,
Geological Survey, Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-02324

ESTUARINE POLLUTION CONTROL: OBJECTIVES AND PRIORITIES,
For primary bibliographic entry see Field 5G.
W77-02343

OCEAN DUMPING PHASE-OUT IN EPA REGION II,
For primary bibliographic entry see Field 5E.
W77-02393

ZOOPLANKTON OF THE REGION OF NOSY BE: VI. PTEROPODS, HETEROPODS: HOLONERITIC AND INTERNAL-NERITIC SPECIES; CONTRIBUTION TO THE STUDY OF A TROPICAL EUTROPHIC BAY, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Nosy-Be (Madagascar). Centre Oceanographique (ORSTOM) de Nosy-Be.
For primary bibliographic entry see Field 5C.
W77-02416

KELP HABITAT IMPROVEMENT PROJECT,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Environmental Engineering Science.
W. J. North.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 913. Price codes: A06 in paper copy, A01 in microfiche. Annual Report, 1974. 115 p. 34 fig., 17 tab., 71 ref. GH-92.

Descriptors: Habitats, *Planting management, *Kelps, Cultures, Storage, Marine algae, Vegetation establishment, Phaeophyta, Nutrient requirements, California, Littoral, Oceans.

Identifiers: *Macrocystis, Egreria laevigata, Cystoseira osmundacea, *Kelp Habitat Improvement Project, Seaweed, Sea urchins.

The results of kelp habitat improvement off the Southern California coast, for fiscal year 1974 are reported. Principal findings included: (1) 1973 harvests from the La Jolla and Point Loma kelp beds fell by 60% and 75% respectively, probably due to severe winter storms, (2) destruction of the Macrocystis canopies at Point Loma was accompanied by changes in the size distributions of the sea urchins, Strongylocentrotus franciscanus and S. purruratus, (3) the north Imperial Beach site was again overrun by seaweed-grazing urchins, (4) kelp restoration in the coastal region from Newport Bay to Laguna Beach is virtually complete, (5) kelp beds between Monarch Bay and Dana Point were greatly expanded, reversing a fifteen year trend of deterioration, (6) Macrocystis plants were introduced to Abalone Cove, (7) a massive development of Egregia and Cystoseira occurred along the Palos Verdes Peninsula, (8) further observations on seasonality patterns of fruiting by Laminaria, Eisenia, Pterygophora, and Agarum were recorded, and (9) Macrocystis developed naturally in areas cleared of Laminaria and Pterygophora, and were transplanted in several areas of Point Loma and La Jolla. Results of laboratory studies involving Macrocystis culture, nutrition, storage, and dispersion are also reported. In addition, a wide variety of studies relating to the effect of sea urchins on seaweed cover is summarized. (Luedtke-Wisconsin)
W77-02417

SALT MARSH ESTABLISHMENT AND DEVELOPMENT,
Environmental Concern, Inc., St. Michaels, Md.
For primary bibliographic entry see Field 4D.
W77-02420

DETRITAL UTILIZATION BY THE POLYCHAETE, CAPITELLA CAPITATA,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-02435

NITRATE REMOVAL FROM WATER AT THE WATER-MUD INTERFACE IN WETLANDS,
Louisiana Agricultural Experiment Station, Baton Rouge.
For primary bibliographic entry see Field 5G.
W77-02441

BIOLOGY OF BLUE-GREEN ALGAE OF TIDE MARSHES,
Delaware Univ., Lewes. Coll. of Marine Studies.
For primary bibliographic entry see Field 5C.
W77-02446

PARTIAL WAVE DAMPING IN PNEUMATIC BREAKWATERS,
Royal Norwegian Air Force Academy, Trondheim.
For primary bibliographic entry see Field 8B.
W77-02455

EVALUATION OF CIRCULATION IN ESTUARIES,
Lawler, Matusky and Skelly Engineers, Tappan, N.Y.
K. A. Abood, and E. L. Bourodimos.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY9, Proceedings Paper 12408, p 1211-1224, September 1976. 6 fig, 23 ref, 2 append.

Descriptors: *Density, *Flow, *Estuaries, *Hudson River, *New York, Fluid mechanics, Hydraulics, Turbulence, Velocity, Equations, Water circulation, On-site investigations, Currents(Water).
Identifiers: *New York Harbor, *Stratified estuaries, Ocean-derived salt, Nontidal flow, Density-induced circulation.

Several approaches for describing density-induced circulation patterns in partially stratified estuaries have been developed. Published techniques developed by several investigators and recently established methods which were used to convert Hudson River tidal velocities and salinity observations to density-induced flow rates were reported in this paper. Generally, the two-layer stratified flow system approach exhibited several favorable characteristics such as relatively more stable and predictable distribution; greater independence of temporary meteorological and local eddy conditions; and simplicity, ease, and availability of more precise detection instruments. Density-induced flow values obtained using the two-layer flow method were more realistic than their salt budget counterparts and were somewhat higher than those derived from tidal velocity observations. (Roberts-ISWS)
W77-02456

MATHEMATICAL MODELS IN HYDRAULICS AND COASTAL ENGINEERING,
International Courses in Hydraulic and Sanitary Engineering, Delft (Netherlands).
For primary bibliographic entry see Field 2A.
W77-02471

ARE THE CHESAPEAKE BAY WATERS WARMING UP,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
D. K. Brady.
Chesapeake Science, Vol 17, No 3, p 225-227, September 1976. 5 fig, 3 ref.

Descriptors: *Chesapeake Bay, *Bays, *Meteorological data, Nuclear powerplants, Water temperature, Air temperature, Thermal water, Time series analysis, Correlation analysis, Waste water(Pollution), Heated water, Water pollution, Maryland, Virginia, *Thermal pollution.
Identifiers: *Bay waters, *Calvert Cliffs nuclear powerplant, *Baltimore Harbor, Surface water temperature, Warming trend, Trends, Standard deviation, Probability of exceedence.

Now, while the Calvert Cliffs Nuclear Power Plant of the Baltimore Gas and Electric Company begins to discharge waste heat into the Chesapeake Bay near Scientists Cliffs, it is pertinent to establish a historical data base for use in judging possible long-term temperature effects of thermal plants on the waters of the bay. The longest, published, continuous time series of water temperature data pertaining to the Chesapeake Bay region is a 49-year record of daily surface water temperatures taken at Fort Henry in Baltimore Harbor by the U.S. Coast and Geodetic Survey from 1914 through 1962. The water temperature data was summarized in 1972. From that data it was learned that temperatures appeared to be increasing at a mean rate of 0.265 C per decade. It is pertinent to ask if surface waters in Baltimore Harbor have been responding slowly to cumulative thermal discharges from the four power plants located in the harbor. The apparent warming trend probably did not extend beyond 1962 according to subsequent observations. A study of a 95-year record of air temperature data pertaining to the Chesapeake Bay region showed that water temperatures and nearby air temperatures responded to the same or similar regional meteorological differences. At that time, the Calvert Cliffs Nuclear Power Plant began to discharge waste heat into Chesapeake Bay, so it was important to determine any previous trend in the harbor water temperature that could be ascribed only to man's activities. Apparently, no such tend could be determined. (Roberts-ISWS)
W77-02472

WATER MOTION ON A BEACH IN THE PRESENCE OF A BREAKWATER: 1. WAVES,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 8B.
W77-02474

WATER MOTION ON A BEACH IN THE PRESENCE OF A BREAKWATER: 2. MEAN CURRENTS,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 8B.
W77-02475

SPECTRAL CHARACTERISTICS OF THE MICROWAVE EMISSION FROM A WIND-DRIVEN FOAM-COVERED SEA,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
W. J. Webster, Jr., T. T. Wilheit, D. B. Ross, and P. Gloersen.
Journal of Geophysical Research, Vol. 81, No. 18, p 3095-3099, June 20, 1976. 4 fig, 3 tab, 16 ref.

Descriptors: *Microwaves, *Arctic, *Winds, *Oceans, *Remote sensing, Aircraft, Waves(Water), Fetch, Wavelengths, Investigations, Oceanography.
Identifiers: *Bering Sea, Microwave emission, Sea foam.

Aircraft observations of the microwave emission from the Bering Sea showed that the spectral character of brightness temperature variation with wind speed in a fully developed sea is due to a combination of surface roughness and a surface layer with varying dielectric constant over a physical depth of a few millimeters. The varying dielectric layer is identified with cusps formed by the bubbles associated with thin foam streaks. Computations of the radiative transfer through such a layer showed that the change in microwave emissivity due to the presence of that layer decreases as microwave wavelength increases. Since foam streak coverage on the ocean surface increases with surface wind speed, the increase in microwave brightness temperature with increasing wind speed will be less at longer wavelengths, a characteristic that is observed in the experimental results presented. In addition, it was observed that in fetch-limited situations the microwave brightness temperature depends in the same way on surface wind speed but is essentially independent of varying foam coverage, the implication being that the surface wave structure becomes more important in determining the microwave brightness temperatures as fetch approaches zero. It appears that microwave brightness temperatures are directly related to ocean surface wind speeds, regardless of fetch. (Sims-ISWS)
W77-02476

THE EFFECT OF THE GEOSTROPHIC FLOW UPON COASTAL SEA ELEVATIONS IN THE NORTHERN NORTH PACIFIC OCEAN,
Scripps Institution of Oceanography, La Jolla, Calif.
J. L. Reid, and A. W. Mantyla.
Journal of Geophysical Research, Vol. 81, No. 18, p 3100-3110, June 20, 1976. 15 fig, 36 ref.

Descriptors: *Sea level, *Water levels, *Pacific Ocean, *Subarctic, Water level fluctuation, Circulation, Water circulation, Seasonal, Coasts, Atmospheric pressure, Currents(Water), Ocean currents, Ocean circulation, Oceanography.
Identifiers: Steric heights, Gyres.

Coastal sea elevations measured at tide gages in the northern North Pacific when adjusted for the atmospheric pressure show a seasonal high in winter (November-February). This high is well out of phase with the mid-ocean response of geopotential anomaly (steric height) to the heating and cool-

ing cycle which produces highest steric elevations in JulybOctober. This paper reported an attempt to show that steric height near the coast varies seasonally in phase with the measurements at the tide gages and that the high elevations in winter are a consequence of the circulation of the subarctic cyclonic gyre of the North Pacific Ocean. The flow of the coastal limb of this gyre (along the eastern, northern, and western boundary of the ocean) is intensified in winter, and in geostrophic balance the sea surface slopes upward toward the coast, accounting for the winter rise. Sea elevation along the eastern boundary as determined from steric height does not slope uniformly downward from the equator toward higher latitudes but has several maxima and minima. These appear to be the consequence of the sea surface slopes associated with the quasi-geostrophically balanced system of cyclonic and anticyclonic gyres in middle and high latitudes and zonal flows near the equator. (Sims-ISWS)
W77-02477

RARE EARTH ELEMENT SUPPLY TO THE OCEAN,
Ecole Normale Superieure, Paris (France). Laboratoire de Geologie.
J-M. Martin, O. Hogdahl, and J. C. Philippot.
Journal of Geophysical Research, Vol. 81, No. 18, p 3119-3124, June 20, 1976. 4 fig, 3 tab, 47 ref.

Descriptors: *Suspended solids, *Sediments, *Oceans, *Rivers, Dissolved solids, Geochemistry, Chemical analysis, Erosion, Foreign countries, Sedimentology, Oceanography.
Identifiers: *Rare earth elements, *Amazon River, *Congo River, *Ganges River, *Mekong River, *Gironde estuary(France), Sediment sources.

More insight on rare earth element pathways from land to ocean came from analyses of suspended matter in four major world rivers (Amazon, Congo, Ganges, Mekong), while their geochemical behavior at the river-ocean boundary was studied in the Gironde estuary (France). The Gironde data indicated that soluble rare earth elements are removed from solution in the estuarine zone; this observation invalidates any rare earth element balance to the ocean which would not take into account the river-ocean boundary processes. Data on rare earth element concentrations in soluble and detrital river loads showed that solid discharge represents the major part of rare earth elements supplied by rivers to the ocean. A rare earth material balance to the ocean was discussed on the basis of the results presented in this paper. (Sims-ISWS)
W77-02478

THE BARROW SUBMARINE CANYON: A DRAIN FOR THE CHUKCHI SEA,
Washington Univ., Seattle. Applied Physics Lab.
G. R. Garrison, and P. Becker.
Journal of Geophysical Research, Vol. 81, No. 24, p 4445-4453, August 20, 1976. 14 fig, 12 ref.

Descriptors: *Submarine canyons, *Arctic, *Arctic Ocean, Flow, Circulation, Water circulation, Ocean circulation, Salinity, Density, Temperature, Water temperature, Surveys, Measurement, Oceanography.
Identifiers: *Chukchi Sea, *Beaufort Sea, *Barrow Canyon.

Oceanographic measurements made in the spring through holes in the ice in an area off Barrow, where the Barrow Canyon forms a sloping through from the shallow Chukchi Sea into the deep Beaufort Sea, revealed two interacting water movements: (1) a flow of highly saline water from the shallow Chukchi Sea into the Beaufort Sea through the Barrow Canyon, and (2) an uprising of Atlantic water from the depths of the Beaufort Sea into the Barrow Canyon. (Sims-ISWS)
W77-02481

ICE MOVEMENT AND DISTRIBUTION IN THE BERING SEA FROM MARCH TO JUNE 1974,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2C.
W77-02482

A TECHNIQUE FOR ESTIMATING TROPICAL OPEN-OCEAN RAINFALL FROM SATELLITE OBSERVATIONS,
Hawaii Univ., Honolulu. Dept. of Meteorology.
For primary bibliographic entry see Field 2B.
W77-02484

MULTIDISCIPLINARY APPLICATION OF LANDSAT-2 DATA TO MARINE ENVIRONMENT IN CENTRAL JAPAN,
Toba Merchant Marine Coll. (Japan).
H. Ochiai.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-18590, Price codes: A02 in paper copy, A01 in microfiche. Quarterly Progress Report E76-10169, 1976. 16 p, 15 fig, 1 tab, 2 ref. NASA LANDSAT Inv. No. 28990.

Descriptors: *Remote sensing, *Bays, *Water quality, *Red tide, Aircraft, Satellites(Artificial), Aerial photography, Data collections, Investigations, Water temperature, Coasts, Foreign countries, Estuaries, Rivers, Pollutant identification.
Identifiers: *LANDSAT, *Japan.

Remote sensing data obtained by LANDSAT-2 are very useful for monitoring the marine environment throughout the year. This quarterly progress report describes the multi-disciplinary application of multi-spectral scanner data acquired over central Japan which revealed several coastal features, pollution, river effluent, coastal process, etc., with the supporting data obtained by airborne remote sensing. (Sims-ISWS)
W77-02498

USE OF LANDSAT DATA FOR NATURAL RESOURCES INVESTIGATION IN THE LOWER BASIN OF DANUBE AND DANUBE DELTA,
Institutul de Constructii din Bucuresti (Rumania). Lab. for Remote Sensing.
N. Oprescu.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-20605, Price codes: A02 in paper copy, A01 in microfiche. Report NASA-CR-146631, December 1975. 12 p, 1 tab.

Descriptors: *Remote sensing, *Rivers, *Sediments, Satellites(Artificial), Data processing, Water resources, Water quality, Runoff, Sedimentation, Eutrophication, Deltas, Foreign countries, Pollutant identification.
Identifiers: *LANDSAT, *Romania, *Danube River, Danube delta.

Due to the delay in the receipt of data, the program of the investigation developments had to be revised. Also, meteorological conditions were unfavorable, thus the accomplishment of the concordance between airborne and space recordings during periods of utmost interest for investigation was impeded. However, the recordings on bands 4 and 5 very clearly showed the sedimentary discharge in sea water at the mouth of the Danube while recordings on bands 6 and 7 showed the successive stages of the evolution of the Danube Delta, clearly marking the separation of the fluvial delta from the marine delta. (Sims-ISWS)
W77-02503

NOTES ON TIDAL INLETS ON SANDY SHORES,
California Univ., Berkeley.
M. P. O'Brien.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-022 328, Price codes: A03 in paper copy, A01 in microfiche. Report of Army Corps of Engineers, Ft. Belvoir, VA., Coastal Engineering Research Center, GITI Report 5, February 1976. 26 p, 7 fig, 12 ref. CERC DACW72-71-C-0005.

Descriptors: *Inlets(Waterways), *Shores, *Tides, *Waves(Water), Coasts, Bays, Estuaries, Beaches, Tidal waters, Tidal effects, Tidal bores, Hydraulics, Model studies, Hydraulic models, Ocean waves, Channels, Flow, Channel flow.

This report presented observations, theories, and analysis that have been found to be applicable to the rational design of coastal inlets. The report also presented various memoranda on the behavior and sedimentary and hydraulic characteristics of tidal inlets on sandy shorelines and is intended to represent a source of ideas for graduate thesis studies as well as a stimulant to other research workers in this field. (Sims-ISWS)
W77-02504

AN EFFECT OF PERMEABILITY ON SAND TRANSPORT BY WAVES,
National Bureau of Standards, Washington, D. C. Inst. for Basic Standards.
K. E. B. Lofquist.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A020 641, Price codes: A04 in paper copy, A01 in microfiche. Report of Army Corps of Engineers, Ft. Belvoir, Va., Coastal Engineering Research Center, Technical Memorandum No. 62, December 1975. 74 p, 20 fig, 19 ref, 2 append.

Descriptors: *Waves(Water), *Sands, *Permeability, Sand waves, Ripple marks, Laboratory tests, Model studies, Coasts, Beaches, Coastal engineering.
Identifiers: *Sand transport, Permeability effects, Ripple profiles, Coastal processes, Oscillatory flow.

Permeability effects on the movement of sand in oscillatory flows were observed in laboratory experiments which approximate prototype conditions at the seabed under progressive waves. A natural sand was used, wave periods ranged between 3 and 14 seconds, and sand surfaces were naturally rippled. The apparatus had a symmetry which removes all effects, except those of permeability, which might cause a net movement of sand. Onshore and offshore directions were determined by phase relationships between the horizontal flows and superposed vertical permeability flows. A positive permeability effect was found in that the ripple profiles move in the onshore direction. The velocity of this motion was measured and described in a simple, dimensionless plot. The associated net transport of sand was not observed directly but can be inferred, to an extent, from the motions of the ripple profiles. The effects of permeability are cumulative and can be significant in coastal processes of long duration. Any estimate of the local rate of sand transport onshore due to permeability involves the distribution of permeabilities within the seabed which are largely unknown. An overall estimate is less than 1 cubic meter per meter of shoreline per year, which is negligible for most engineering considerations. (Sims-ISWS)
W77-02508

TOXICITY, UPTAKE AND SURVEY STUDIES OF BORON IN THE MARINE ENVIRONMENT,
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 5C.
W77-02565

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

PROSPECTS FOR AN AGRO-INDUSTRIAL COMPLEX ON THE GAZA-SINAI SEA COAST,
State Univ. of New York at Buffalo.
J. Haupert.
Ecumene, Vol. 7, p 21-24, February, 1975. 1 fig, 9 ref.

Descriptors: *Water costs, *Water resources development, *Potential water supply, *Water supply, *Desalination, Arid lands, Nuclear powerplants, Irrigation, Costs, Industrial plants, Agronomic crops, Fertilizers, Deserts, Land use, Human population, Water shortage.
Identifiers: *Gaza-Sinai sea coast region.

In the Gaza-Sinai sea coast region any industrial or agricultural development is dependent upon an adequate water supply. The prospects for such development and its effect on water resources are discussed. About forty-five percent of the arable land in the Gaza is presently irrigated, mainly from wells. Some water is available from winter rains. The alternative to these water resources is desalination which would require sizeable amounts of power. The use of nuclear power and oil and gas is evaluated. One alternative is to construct a large agro-industrial complex that would not only produce and utilize desalinated water, but which could contribute low cost chemical fertilizers for use in the area. The obvious disadvantage of such a project is the cost. Two desalination plants capable of producing 250 million gallons of fresh water per day would require an investment of at least $400 million. In addition to the cost of water, the types of crops that might be grown and the industries constructed are discussed. (Jamail-Arizona)
W77-02115

WATER SUPPLY AND SEWAGE TREATMENT IN ARID AREAS.
For primary bibliographic entry see Field 5D.
W77-02173

DESALINATION TO PLAY A MAJOR PART IN MIDDLE EAST WATER SUPPLY.
Water Services, Vol. 80, No. 960, p 92,94, February, 1976.

Descriptors: *Desalination, *Desalination plants, *Desalination apparatus, *Water purification, *Desalination processes, Potable water, Water supply, Water resources, *Water treatment, Water quality, Distillation, Water quality, Water softening, Water sources, Water resources development, Water supply development, Water demand.
Identifiers: *Middle East, Qatar.

With Middle East countries devoting a large part of their oil revenues to building modern industrial infrastructures and improving living standards generally, the demand for pure water is growing rapidly. Scarcity of water in the Middle East is likely to lead to reliance upon desalination plants to meet water demands, and desalination as a possible water source for drinking and industrial needs is discussed. In the area, most desalination plants work by distillating sea water. The design of plants being constructed in Qatar is discussed. Each of the plants will be capable of producing four million and five million gallons of fresh water per day depending upon the method utilized. The operation of the plants, which are part of an extensive program of development and industrialization being conducted by the government of Qatar, is discussed. (Jamail-Arizona)
W77-02175

DESERT FOOD FACTORIES,
Arizona Univ., Tucson. Environmental Research Lab.
For primary bibliographic entry see Field 3C.
W77-02176

THE INFLUENCE OF THE RAW WATER CONDITIONING ON THE WORKING DATA OF A REVERSE OSMOSIS PLANT TO PRODUCE ULTRA-PURE WATER (EINFLUSS DER ROHWASSERKONDITIONIERUNG AUF BETRIEBSDATEN EINER UMKEHROSMOSE-ANLAGE ZU REINSTWASSERERZEUGUNG),
For primary bibliographic entry see Field 5D.
W77-02355

ELECTRODE KINETICS OF ANTIMONY IN ACIDIC CHLORIDE SOLUTIONS,
California Univ., Los Angeles. School of Engineering and Applied Science.
L. L. Wilkstrom, N. T. Thomas, and K. Nobe.
Electrochemical Science and Technology, Journal of the Electrochemical Society, p 1201-1206, 10 fig, 15 ref. September 1976. (California Water Resources Center Seawater Desalination Project).

Descriptors: *Polarization, Kinetics, Electrodes, Equations, Oxidation-reduction potential.
Identifiers: Electrodissolution, Electrodeposition, *Antimony, Acidic chloride solutions.

The kinetics of the electrode processes of antimony in KC1-HC1 solutions have been investigated. The rest potential of antimony in acidic chloride solutions can be expressed empirically by the equation Ee=0.182-0.06pH+0.020 log (Sb(III)) and is attributed to the redox reaction Sb+2H20=HSb02+3H++3e the empirical rate equations for electrodissolution and electroeduction Ia=Ka(OH-) (Sb(III))-11e2FE/RTand Ic=Kc(H+)2e-FE/RT the rate of electrodeposition of Sb(III) can be expressed as Ic, dep = Kc, dep (H+)(Sb(III))e-FE/2RT a mechanism which is consistent with the experimental results is proposed. (Snyder-California, Davis)
W77-02533

TURBULENT TRANSPORT TO A ROTATION CYLINDER FOR LARGE PRANDTL OR SCHMIDT NUMBERS,
Rice Univ., Houston, Tex. Dept. of Mechanical and Aerospace Engineering and Materials Science.
R. M. Smith, and R. Greif.
Journal of Heat Transfer, p. 594-597, Nov. 1975. (California Water Resources Center Sea Water Desalination Project).

Descriptors: *Mass transfer, *Heat transfer, *Desalination, Equations.
Identifiers: *Prandtl numbers, *Schmidt numbers.

The heat or mass transport to a rotating cylinder is obtained by solving the conservation equations for large Prandtl or Schmidt numbers. A modified mixing length, which includes the effect of centrifugal forces in terms of the Richardson number, is used. Explicit relations are presented for the heat or mass transport and a comparison is made with the experimental data over a range of Prandtl and Schmidt numbers from 190 to 11,000. (Snyder-California, Davis)
W77-02534

DETERMINATION OF SURFACE EQUILIBRIA AND MASS TRANSFER RATES IN A CONCURRENT FLOW BUBBLE COLUMN,
California Univ., Berkeley. Dept. of Chemical Engineering.
E. Valdes-Krieg, J. C. King, and H. H. Sephton.
In: Advances in Interfacial Phenomena, AICHE Symposium Series, Vol. 71, No. 150, p. 46-51, (1976). 4 fig, 21 ref. (California Water Resources Center Sea Water Desalination Project).

Descriptors: *Mass transfer, *Desalination, *Adsorption, Equilibrium, Measurement, Dispersion, Model studies.
Identifiers: *Surface equilibria.

A technique which allows measurement of surface equilibria in a straightforward fashion in concurrent-flow gas-liquid bubble columns is described. The method appears to offer advantages over other procedures currently in use and is also adaptable to situations involving very low collector concentrations incapable of supporting a foam. The technique also enables simultaneous determination of effective axial dispersivities and mass transfer coefficients to the surface on the basis of an axial dispersion model. (Snyder-California, Davis)
W77-02535

3B. Water Yield Improvement

THE ARIZONA WATER PLAN: A STATUS REPORT,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 4D.
W77-02104

MANAGING THE SOUTHWESTERN NATIONAL FORESTS FOR WATER AND RELATED RESOURCES,
Forest Service (USDA), Washington, D. C.
For primary bibliographic entry see Field 4A.
W77-02107

WATERSHED MANAGEMENT'S EFFECTS ON MANY RESOURCES,
Arizona Univ., Tucson. School of Renewable Natural Resources.
P. F. Ffolliott, and D. B. Thorud.
In: 19th Annual Arizona Watershed Symposium Proceedings, Report No. 7, p 39-42, September 1975. 11 ref.

Descriptors: *Watershed management, *Arizona, *Water yield improvement, *Resources development, Vegetation effects, Coniferous forests, Ponderosa Pine Trees, Forest watersheds, Forest management, Chaparral, Soil-water-plant relationships, Wildlife management, Canopy, Livestock.

An overview is presented of water yield improvement research as evaluated in terms of multiple use management and emphasizing conifer forests, ponderosa pine forests, and chaparral shrub zones. Results suggest that vegetation management has the potential for increased water yield, while maintaining or enhancing the production and use of associated natural resources and minimizing the destruction of on-site soil resources. The three vegetation zones highlighted are believed to have the greatest potentials for increasing water yield through vegetation management. Tests on those vegetation zones are described, with experimental watersheds in different areas showing improved water yield. Clearing or thinning of vegetation overstories in conifer and ponderosa pine forests to improve water yield is also consistent with primary wood harvesting activities. Herbage production is generally increased, with a resultant increase in potential livestock carrying capacities. Wildlife response in experimental watersheds suggests an improved habitat by opening up dense brush, thereby increasing ease of movement and abundance of forage. Esthetic and soil responses to vegetation management are also discussed. (See also W77-02104) (Jahns-Arizona)
W77-02109

WOODS CANYON--A LARGE SCALE WATERSHED MANAGEMENT EXPERIMENT: AN EXPLANATION AND INTERIM REPORT,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
D. R. Carder.

In: 19th Annual Arizona Watershed Symposium Proceedings, Report No. 7, p 43-46. September, 1975. 1 tab, 8 ref.

Descriptors: *Watershed management, *Forest management, *Water yield improvement, *Demonstration watersheds, *Arizona, Vegetation effects, Surface runoff, Land use, Wildlife management, Pine trees.
Identifiers: *Woods Canyon(Ariz), *Beaver Creek(Ariz).

Progress is reported on the watershed management experiment being conducted at Woods Canyon, a 10,700 acre watershed located within the Beaver Creek watershed south of Flagstaff, Arizona. Studies were undertaken to learn whether modification of vegetation could produce more water in the Salt-Verde River Basin; ponderosa pine and pinyon-juniper vegetation in the Beaver Creek watershed account for 60% of the total Basin runoff. Woods Canyon and a control site are described and the objectives of the experiment outlined along with a land use plan being formulated. Major management alternatives considered for the pine lands in the Woods Planning Unit are discussed. One alternative emphasizes primary wood production on an even flow basis over the entire area. The second alternative stresses equally the production of timber and the maintenance and improvement of big game habitat. The third involves retaining natural conditions and esthetics while preserving commodity production on some of the more productive soils. The fourth alternative stresses water yield and livestock forage. Potential effects on water yield for each approach are analyzed; alternative four promises the greatest yield of both forage and water. (See also W77-02104) (Jahns-Arizona)
W77-02110

CHAPARRAL MANAGEMENT: ITS POTENTIAL--ITS PROBLEMS--ITS FUTURE,
Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
J. H. Dieterich.
In: 19th Annual Arizona Watershed Symposium Proceedings, Report No. 7, p 47-51, September, 1975. 1 fig, 15 ref.

Descriptors: *Chaparral, *Range management, *Southwest U.S., *Arizona, *Water yield improvement, Land clearing, Burning, Land use, Environmental effects, Chemcontrol, Herbicides.
Identifiers: *Chaparral management.

Various approaches are discussed to chaparral management in the Southwest, especially in Arizona. The amount of land meeting criteria for active management must be ascertained. Other considerations include environmental effects, potentials for increasing water yield, forage production and recreational opportunities, and methods for reducing fire suppression costs in chaparral areas. Conversion of 21% of the chaparral could increase Arizona's yearly water supply by an average of 150,000 acre feet (2% of the total). Other possible effects of conversion are described, including increased erosion. Chaparral can be controlled or eliminated mechanically by rootplowing, prescribed burning, and with herbicides; the costs and effectiveness of each method and some management alternatives are analyzed. Management by protection is still the main approach but is inadequate; one problem is the lack of financing for large-scale conversion and maintenance operations. Another problem involves finding an effective and environmentally acceptable chemical for initial treatment and maintenance on chaparral watersheds. More intensive management in the future is likely, and continued research will be necessary. Some possible directions of research are discussed. (See also W77-02104) (Jahns-Arizona)
W77-02111

DROUGHT HAZARD IN THE UNITED STATES: A RESEARCH ASSESSMENT,
Colorado Univ., Boulder. Inst. of Behavioral Science.
R. A. Warrick, P. B. Trainer, E. J. Baker, and W. Brinkman.
NSF Program on Technology, Environment and Man, Monograph NSF-RA-E-75-004, 1975. 199 p, 41 fig, 11 tab, 171 ref, 1 append.

Descriptors: *Droughts, *Water shortage, *Water demand, *Water conservation, Agriculture, Water resources, Water reuse, Desalination, Precipitation(Atmospheric), Rainfall, Moisture deficit, Water supply, Irrigation, Climatology, Meteorology, Weather forecasting.
Identifiers: *Agricultural drought, *Urban drought.

An overview of droughts, their causes and effects, is presented. The main focus is drought hazard, determined by the degree to which urban or agricultural demands are over-extended in relation to a highly variable resource, precipitation. Unlike floods and most other geophysical hazards which have a relatively quick onset and short duration, drought is a creeping phenomenon. It is often difficult to ascertain when a drought begins, and when it ends. The question of whether or not an extended dry spell has, in fact, become a drought causes considerable debate among meteorologists, farmers and public officials. The report is divided into two main sections: agricultural drought and urban drought. In each section the factors used to determine drought are discussed. It is concluded that during the past twenty years research emphasis has been on the technical aspects of increasing water supply and on weather modification programs. More research should be conducted on reducing water demand and investigating water reuse programs, desalination, and other water saving devices. (Jamail-Arizona)
W77-02113

EFFECT OF ABSCISIC ACID AT DIFFERENT LEVELS OF SOIL WATER POTENTIAL ON THE TRANSPIRATION OF ZEA MAYS,
Aarhus Univ. (Denmark). Inst. of Plant Physiology.
M. Talha, and P. Larsen.
Physiologia Plantarum, Vol. 37, No. 2, p 104-106, 1976. 1 fig, 11 ref.

Descriptors: *Evapotranspiration control, *Soil water, *Corn(Field), *Moisture stress, *Moisture deficit, Arid lands, *Transpiration, Soil moisture, Soil surfaces, Soil types, Soil water movement, Soil-water-plant relationships, Moisture content, Evapotranspiration, Water loss, *Acids, *Antitranspirants, Water yield improvement.
Identifiers: *Abscisic acid.

In previous attempts to reduce evapotranspiration, chemical antitranspirants in solution have been applied to leaf surfaces. Recently, the capability of abscisic acid in reducing transpiration was demonstrated in a number of plant species but none of these works dealt with the effect of exogenous abscisic acid under conditions of soil moisture deficit, which usually prevail in arid regions. In this study, experiments were conducted to demonstrate the effect of abscisic acid on transpiration at different levels of soil water potential. This relationship upon corn leaves was studied in growth chamber experiments. Preliminary results seem to indicate that abscisic acid could serve as an efficient antitranspirant at certain intermediary soil water potentials. Further research is needed to determine the optimum and most economic concentration of abscisic acid or some other compound as an antitranspirant for various plant species grown in different types of soil with different water potentials. (Jamail-Arizona)
W77-02121

ECOLOGICAL IMPACTS OF SNOWPACK AUGMENTATION IN THE SAN JUAN MOUNTAINS OF COLORADO.
Colorado State Univ., Fort Collins. Coll. of Forestry and Natural Resources.
Report No. CSU-FNR-7052-1, March 1976. 501 p. Steinhoff, H.W., and Ives, J.D., editors. USBR 14-06-D-7052.

Descriptors: *Colorado, *Ecology, *Snowpacks, *Environmental effects, *Weather modification, Mountains, Snow, Environment, Phenology, Geomorphology, Plant growth, Productivity, Small animals(Mammals), Big game, Mammals, Forests, Oak trees, Coniferous trees, Silver iodide, Cloud seeding, Climates, Fescues, Tundra, Alpine, Growth stages.
Identifiers: *San Juan Mountains(Colo).

Effects were studied of varying snowpack on the ecosystems of the San Juan Mountains in Colorado from 1970 to 1975. Initiation of shoot elongation was delayed for plants in the tundra and forests as a result of lower temperatures associated with deeper snowpack. The delay was most apparent for herbaceous species, such as Thurber fescue, whose growth points lay in the immediate zone of lower temperature at ground level. The effect on trees such as Engelmann spruce and quaking aspen was less. The result was a decrease in biomass production of herbaceous species, but not of trees or of Gambel oak, which was found in a zone that became snow clear very early. The delay in beginning of growth persisted through the other stages of the annual cycles of most plants but with less magnitude. There seemed universally a compensation factor which permitted each species to compress its annual cycle in years with a shorter growing season caused by greater depth of snowpack. Phytosociological studies in both forests and tundra showed that plant communities were arranged along a snow clear date gradient. In the forest, Gambel oak gives way to quaking aspen, then to subalpine fir, and finally to Engelmann spruce, as the snow clear date extends later into the year. A noticeable decline in forest populations of deer mice and, to a lesser extent, chipmunks and Microtus spp., followed winters of heavy snowfall. The basic reason was a delay in breeding and in availability of essential foods. No similar effect was found for the pocket gopher or mountain toad. Elk were almost excluded from regions with more than 70 cm of penetrable snow depth, and their travel was noticeably restricted at depths over 40 cm. Movement of elk to higher elevations in spring coincided with the initiation of growth of herbaceous plants rather than directly with the receding snow line, and adequate calving areas were always present. Plant litter in the tundra decreased in areas of deeper snowpack. Local changes in the rate of soil erosion may increase by a factor of 10 as a result of the greater area of bare soil left by the decrease in vegetative cover around snowbanks. No significant increases in silver concentration were detected, because of the small amounts added in cloud seeding and the high background levels of silver in the target area. No deleterious effects of silver iodide have been found at concentrations which could be expected due to cloud seeding. (Humphreys-ISWS)
W77-02160

COMPETITION AND SPACING IN PLANT COMMUNITIES: THE NORTHERN MOHAVE DESERT,
Pennsylvania State Univ., University Park. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W77-02174

SODIUM RELATIONS IN DESERT PLANTS: 5. CATION BALANCE WHEN GROWN IN SOLUTION CULTURE AND IN THE FIELD IN THREE SPECIES OF LYCIUM FROM THE NORTHERN MOJAVE DESERT,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.

For primary bibliographic entry see Field 3C.
W77-02178

POTENTIAL FOR DEVELOPMENT OF GROUND WATER AT A TEST SITE NEAR TRURO, MASSACHUSETTS,
Geological Survey, Boston, Mass. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-02306

RECONNAISSANCE OF GROUND-WATER RESOURCES OF THE SQUAXIN ISLAND INDIAN RESERVATION, WASHINGTON,
Geological Survey, Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-02308

ECONOMIC IMPACTS OF WEATHER VARIABILITY,
Missouri Univ., Columbia. Dept. of Atmospheric Science.
J. D. McQuigg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 349, Price codes: A12 in paper copy, A01 in microfiche. Report No. NSF-RA-3-75-125, August 1975. 263 p, 13 fig, 12 tab, 285 ref, 2 append. GI 137218X, ESR73-07752-A01.

Descriptors: *Weather, *Bibliographies, *Abstracts, *Weather modification, Agriculture, Crop response, Crop production, Energy, Forest fires, Public health, Recreation, Construction, Farm equipment, Transportation, Water utilization, Economics, *Economic impact.

Selected interactions between weather and weather-sensitive activities are summarized quantitatively in this compendium designed to assist weather modification project managers. Weather dependent relationships examined are: (1) agriculture, emphasizing wheat, corn, soybeans, grain sorghum, flax, oats, rye, barley, rice, and sugar beets, (2) forest fires, (3) energy demand and alternative energy sources, (4) outdoor activities, including construction, farm machinery, transportation, and recreation, and (5) health and disease effects on humans, farm animals, and crops. Most of the material concerning these interactions deals with direct meteorological impacts; the physical or biological impacts of weather on various enterprises. Also included is a section on the indirect impact of weather, the economics of non-agricultural water usage. These annotated bibliographies are followed by a brief discussion of the use of principal components estimators in multivariate regression, and state wheat yield models. Both an author and subject index are included. (Luedtke-Wisconsin)
W77-02429

INADVERTENT WEATHER MODIFICATION,
Illinois State Water Survey, Urbana.
S. A. Changnon, Jr.
Water Resources Bulletin, Vol. 12, No. 4, p 695-718, August 1976. 7 fig, 6 tab, 52 ref.

Descriptors: *Weather modification, *Cities, *Precipitation(Atmospheric), *Clouds, Weather, Urbanization, Industries, Smoke, Rainfall, Temperature, Humidity, Thunderstorms, Hail, Rain, Urban runoff, Urban hydrology, Climatology, Meteorology.
Identifiers: *Inadvertent weather modification, Urban effects, Visibility.

Man, through modifications of the biosphere, has been affecting the atmosphere on local and regional scales for many years. These alterations have been produced by urban industrial centers, non-urban industrial centers, land use changes in rural areas (deforestation, crop changes, drainage, etc.), and marine areas. Also, a major means whereby man has affected weather has been through his urban environment. More intensively than any other comparable-sized part of the earth's surface, cities are converters of energy and matter, thus directly affecting the heat budget, moisture budget, and exchange of mass in the atmosphere. Consequently, the changes in weather wrought by urbanization encompass all major surface weather conditions. The list of elements or conditions affected includes the contaminants in the air, solar radiation, temperature, visibility, humidity, wind speed and direction, cloudiness, precipitation, atmospheric electricity, severe weather, and certain mesoscale synoptic weather features. This paper specifically addressed the subject of urban-industrial effects on clouds and precipitation in the United States. What has been studied and claimed, as shown by climatic research and limited field experiments, was reviewed first. The scientific controversies related to this subject were treated and then followed by a discussion of the apparent impact and relevance of the changes in precipitation conditions. The summary of the paper identified the key problems. (Sims-ISWS)
W77-02453

SILVER CONTENT OF PRECIPITATION FROM SEEDED AND NONSEEDED FLORIDA CUMULI,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 2K.
W77-02485

MOLECULAR STUDIES OF THE ICE-FORMING CAPABILITIES OF DIFFERENT SURFACES,
Gidrometeorologicheskii Institut, Leningrad (USSR).
V. G. Morachevsky, and N. A. Dubrovich.
Journal of the Atmospheric Sciences, Vol. 33, No. 10, p 1989-1994, October 1976. 5 fig, 3 tab, 6 ref.

Descriptors: *Nucleation, *Cloud seeding, *Cloud physics, *Ice, Crystals, Chemistry, Silver iodide, Salts, Laboratory tests, Molecular structure, Hail, Clouds, Precipitation(Atmospheric), Weather modification, Meteorology.
Identifiers: *Molecular studies, Hail suppression.

The objective of the present study was to determine the nature of ice-forming capabilities of different chemical compounds whose effectiveness is determined by the character of the forces binding water molecules to the surface of the compound. Adsorption layers of water and ammonia on the salts of silver and lead were studied. Dependence between the surface properties and ice-forming capabilities of the chemical compounds was investigated. Direct molecular structural analysis by infrared spectroscopy and nuclear-magnetic resonance was used in the studies. An active nucleus whose surface stimulates the water-to-ice phase transition for water molecules condensed on it must have a hydrophobic matrix with open structure and centers capable of interacting with water molecules. There seems to be two reasonable ways of artificially modifying a surface with the objective of stimulating the water-to-ice phase transition of condensed water: (1) contamination of the hydrophobic surface with active centers, which can interact with water molecules, or (2) suppression or removal of part of the active centers of a hydrophilic surface. (Sims-ISWS)
W77-02487

3C. Use Of Water Of Impaired Quality

CALIFORNIANS FIGHT SALT WITH WATER.
Irrigation Age, Vol. 9, No. 9, p 14-15, July-August 1975.

Descriptors: Irrigation, Furrow irrigation, Sprinkler irrigation, Salinity, Soils, Saline soils, Salt tolerance.

Confronted with two techniques for reducing salt levels while preparing soil in the Imperial Valley, a Brawley, California farm manager has opted for a combination of both: row irrigation and sprinkler irrigation. But his emphasis is still on sprinkling, which has become popular for germinating a crop. (Skogerboe-Colo St)
W77-02094

UTILIZATION OF NUTRIENTS FROM WASTEWATER BY WHEAT,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5D.
W77-02112

PROSPECTS FOR AN AGRO-INDUSTRIAL COMPLEX ON THE GAZA-SINAI SEA COAST,
State Univ. of New York at Buffalo.
For primary bibliographic entry see Field 3A.
W77-02115

VEGETATION AND SOIL OF SALINE DEPRESSIONS NEAR NAJAF, CENTRAL IRAQ,
Baghdad Univ., (Iraq). Dept. of Botany.
H. Abul-Fatih.
Vegetatio, Vol. 30, No. 2 p 107-115, 1975. 7 fig, 2 tab, 19 ref.

Descriptors: *Saline lakes, *Soil moisture, Plant groupings, Soil types, Salinity, Saline water, Vegetation, Root systems, Deserts, Arid lands, Plant growth, Desert plants, Soil-water-plant relationships.
Identifiers: *Iraq, Iraqi deserts.

The vegetation of saline depressions in the Iraqi deserts has remained almost entirely unexplored. A study was conducted to describe and analyze the saline depression of Bahr-al-Najaf with the following objectives: (1) to distinguish and characterize the plant communities in the area and their distribution, (2) to relate the distribution to selected soil parameters, and (3) to study the physiognomy and root systems of some selected dominant plant species and relate these to soil moisture and salinity. The results are presented. Active plant growth occurs in the summer. Plant distribution is determined by a gradient in salt and water content. Root systems seem strongly correlated to the depth of subsoil moisture. The relationships between plant distribution and salt and water regime are relatively similar to those found in other parts of the Mediterranean region. (Jamail-Arizona)
W77-02116

DESERT FOOD FACTORIES,
Arizona Univ., Tucson. Environmental Research Lab.
C. N. Hodges.
Technology Review, Vol. 77, No. 3, p 32-39, January, 1975. 2 tab.

Descriptors: *Desalination, *Irrigation practices, *Desalination processes, *Vegetable crops, *Crop production, *Greenhouses, Water treatment, Desalination apparatus, Irrigation, Arid lands.
Identifiers: *Abu Dhabi, Waste heat.

New ways need to be found to increase productivity of land available for farming. In Abu Dhabi, agricultural crops are being produced from one of the least arable lands on earth. Desalted water, distilled with waste heat captured from generators, is used to irrigate vegetables inside plastic covered greenhouses. The concept was tested at Puerto Penasco, Mexico. This article explains the process and evaluates the results. Crop production has been high, but costly greenhouse construction

makes the concept practical only for high-value crops. (JamailsArizona)
W77-02176

SODIUM RELATIONS IN DESERT PLANTS: 5. CATION BALANCE WHEN GROWN IN SOLUTION CULTURE AND IN THE FIELD IN THREE SPECIES OF LYCIUM FROM THE NORTHERN MOJAVE DESERT,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
R. T. Ashcroft, and A. Wallace.
Soil Science, Vol. 122, No. 1, p. 48-51, 1976. 4 tab, 6 ref.

Descriptors: *Desert plants, *Saline soils, Sodium, Cations, Deserts, Soil types.
Identifiers: *Mojave Desert.

Lycium (wolfberry or desert thorn) is an indicator of saline conditions of the soils of the northern Mojave Desert. Three Lycium species were grown in nutrient solutions with varying sodium levels to determine if the differential responses to cations in the field were reproducible in the greenhouse. In spite of the differences in amounts of cations supplied in the nutrient solutions, the same trend in leaf concentrations as exhibited by field plants held remarkably well for each of the three cations of the three species. Root and leaf analysis indicate that L. andersonii is a poor accumulator of sodium and that the other two Lycium species transport sodium to shoots rather than retain it in roots. A high level of sodium chloride in the nutrient substrate resulted in increased total cations in all three species. There was no relationship in total cation content of the plants with total contents of sodium + potassium + chloride. In whole plants collected from the field, high cation concentrations in leaves were related to differential distribution among plant parts for the three species so that leaf differences were compensated for without differences on the whole plant basis. (Jamail-Arizona)
W77-02178

MOVEMENT OF FERTILIZER AND HERBICIDE THROUGH IRRIGATED SANDS,
Florida Univ., Gainesville. Dept. of Soil Science; and Florida Univ., Gainesville. Inst. of Food and Agriculture.
For primary bibliographic entry see Field 5B
W77-02219

A MODEL FOR THE SIMULTANEOUS PRODUCTION AND DIFFUSION OF FERROUS IRON IN SUBMERGED SOILS,
Agricultural Univ., Wageningen (Netherlands). Dept. of Soils and Fertilizers.
For primary bibliographic entry see Field 2G.
W77-02278

INTERACTIONS OF MICRONUTRIENTS IN BARLEY GROWN ON ZINC-POLLUTED SOILS,
Himachal Pradesh Univ., Palampur (India).
For primary bibliographic entry see Field 2G.
W77-02287

ENVIRONMENTAL IMPLICATIONS OF N FIXATION BY SOYBEANS,
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
J. W. Johnson, L. F. Welch, and L. T. Kurtz.
Journal of Environmental Quality, Vol. 4, No. 3, 1975. p 303-306, 3 fig, 2 tab, 7 ref.

Descriptors: *Nitrogen, *Nitrogen fixation, *Soybeans, Crop production, Corn(Field), Crop response, Fertilizers, Fertilization, Nutrients, Nutrient removal.

The objective was to measure inorganic N removal from soil by soybeans grown at different N levels. Nodulating and non-nodulating isolines of 'Clark' soybeans were planted on Flanagan silt loam in 1972 and 1973. Fertilizer rates of 0, 112, 224, and 448 kg N/ha as Ca(NO3)2 enriched with 1% 15N were applied. Symbiotically fixed N decreased from 48 to 10% of the total N in the above-ground plant as applied fertilizer N increased from 0 to 448 kg/ha. Net removals of N by soybean grain were 61, 109, 135, and 149 kg/ha at 0, 112, 224, and 448 kg fertilizer N/ha rates, respectively. Corn grain grown on adjacent plots removed 62, 123, 129, and 133 kg N/ha at fertilizer N rates of 0, 112, 224, and 336 kg/ha, respectively. The study indicates that soybeans are good scavengers for inorganic N in soils.(Skogerboe-Colo St)
W77-02289

NITRATE-NITROGEN REMOVAL FROM SOIL PROFILES BY ALFALFA,
Southwestern Great Plains Research Center, Bushland, Tex.
For primary bibliographic entry see Field 2G.
W77-02290

SALT WATER DOMESTIC WASTE TREATMENT,
Rice Univ., Houston, Tex. Dept. of Environmental Science and Engineering.
For primary bibliographic entry see Field 5D.
W77-02353

SPRAY IRRIGATION SOLVES DISPOSAL PROBLEM,
Van Note-Harvey Associates, Princeton, N.J.
For primary bibliographic entry see Field 5D.
W77-02356

WASTEWATER REUSE-INDUSTRIAL, MUNICIPAL, OR BOTH,
Maintenance Engineering Corp., Houston, Tex.
For primary bibliographic entry see Field 5D.
W77-02358

SOYBEAN YIELD RESPONSES AND ASSIMILATION OF ZN AND CD FROM SEWAGE SLUDGE-AMENDED SOIL,
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W77-02377

CROP RESPONSE TO TANK TRUCK APPLICATION OF LIQUID SLUDGE,
Ball State Univ., Muncie, Ind. Dept. of Natural Resources.
For primary bibliographic entry see Field 5C.
W77-02390

A STUDY OF BACTERIAL AEROSOLS AT A WASTEWATER IRRIGATION SITE,
Army Medical Bioengineering Research and Development Lab., Frederick, Md.
For primary bibliographic entry see Field 5A.
W77-02392

MODELING REACTIONS AND TRANSPORT OF POTASSIUM IN SOILS,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W77-02529

3D. Conservation In Domestic and Municipal Use

UTILITY OF URBAN RUNOFF MODELING, (PROCEEDINGS OF A SPECIAL SESSION, SPRING ANNUAL MEETING, AMERICAN GEOPHYSICAL UNION, WASHINGTON, D.C. 14 APRIL 1976.
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 2A.
W77-02076

ANALYSIS OF STORM WATER SEEPAGE BASINS IN PENINSULAR FLORIDA,
Florida Univ., Gainesville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-02083

DROUGHT HAZARD IN THE UNITED STATES: A RESEARCH ASSESSMENT,
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 3B.
W77-02113

RATIONAL WATER PRICING IN THE TUCSON BASIN,
Arizona Univ., Tucson. Coll. of Business and Public Administration.
For primary bibliographic entry see Field 6D.
W77-02170

PRICING URBAN WATER,
Arizona Univ., Tucson. Coll. of Business and Public Administration.
For primary bibliographic entry see Field 6D.
W77-02171

CHARACTERIZATION OF URBAN RUNOFF,
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W77-02180

PHYSICAL AND ECONOMIC EFFECTS ON THE LOCAL AGRICULTURAL ECONOMY OF WATER TRANSFER TO CITIES,
Economic Research Service, Fort Collins, Colo. Natural Resource Economics Div.
For primary bibliographic entry see Field 6B.
W77-02190

FLOW DATA COLLECTION FOR INFILTRATION-INFLOW ANALYSIS,
Whitman, Requardt and Associates, Baltimore, Md.
For primary bibliographic entry see Field 5D.
W77-02334

SALT WATER DOMESTIC WASTE TREATMENT,
Rice Univ., Houston, Tex. Dept. of Environmental Science and Engineering.
For primary bibliographic entry see Field 5D.
W77-02353

MARYLAND HIGHWAY DRAINAGE STUDY: VOLUME III - A LINKED SYSTEM MODEL FOR THE SYNTHESIS OF HYDROGRAPHS IN URBAN AREAS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W77-02492

3E. Conservation In Industry

MATHEMATICAL MODELS FOR USE IN PLANNING REGIONAL WATER RESOURCES AND ENERGY SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.

For primary bibliographic entry see Field 6A.
W77-02079

DROUGHT HAZARD IN THE UNITED STATES: A RESEARCH ASSESSMENT,
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 3B.
W77-02113

WATER REQUIREMENTS FOR SOLAR ENERGY,
Arizona State Univ., Tempe.
C. E. Backus, and M. L. Brown.
American Water Works Association, Journal, Vol. 68, No. 7, p 366-369, July, 1976. 8 fig, 13 ref.

Descriptors: *Water requirements, *Available water, *Energy conversion, *Solar radiation, *Water utilization, *Water allocation(Policy), Water management(Applied), Electric power, Powerplants, Water, Natural resources, Competing uses, Consumptive use, Evaporation, Water supply, Runoff, Cooling water, Energy.
Identifiers: *Solar energy.

Like many of the systems that convert traditional energy sources into more useful forms, some that convert direct solar energy require water, usually for cooling. The use of several forms of energy for converting solar energy and their water requirements are discussed and evaluated. Of the many proposed applications for solar energy use, electric power generation is the one expected to require the largest amounts of water. Some thermal plants also require significant amounts of water, while the photovoltaic plants require no water. The inter-dependence of insolation and water availability is a factor in determining the type of solar power plant that is feasible in a given area. Maps compare the mean annual runoff and groundwater supplies with the mean daily total or direct insolation, when there is nothing such as dust or water vapor between the sun and the collector. Cooling method and mechanisms are evaluated and projections regarding the use of solar energy are given. (Jamail-Arizona)
W77-02122

A COMPUTERIZED INFORMATION SYSTEM ON THE IMPACTS OF COAL-FIRED ENERGY DEVELOPMENT IN THE SOUTHWEST,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6G.
W77-02163

THE COPPER INDUSTRY AND WATER IN ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
L. A. Snow.
Master of Science Thesis, 1976. 81 p, 8 fig, 16 tab, 42 ref, 1 append.

Descriptors: *Copper, *Overdraft, *Industrial water, *Mine water, *Water demand, Water utilization, Competing uses, Water policy, Water allocation(Policy), Water resources, Water conservation, Water requirements, Water users, Groundwater availability, Water management(Applied), Groundwater mining, Groundwater resources, *Arizona, Mining, Groundwater.

Two of Arizona's most important natural resources are copper and water. The water requirements of the copper industry in Arizona are discussed and evaluated. Copper deposits are located in areas with little or no surface water, which has resulted in the exploitation of groundwater resources. As a result, many areas of the state are experiencing groundwater overdraft. The copper industry's water requirements are expected to increase over the next 10 to 20 years and the impact on the state's water resource is discussed. In order to deal with this situation, conservation measures must be adopted. The various conservation methods available to reduce the copper industry's new water requirements, a comprehensive water plan, land use regulation strategies, and taxing schemes are presented. Various water saving devices that might be employed by the copper companies are also discussed. The most important measures would be the use of sewage effluents in mining and processing copper. However, for the long run, a comprehensive water plan must be developed at the state level. (Jamail-Arizona)
W77-02166

THE AQUACULTURE OF FRESH WATER PRAWNS, MACROBRACHIUM SPECIES,
Oceanic Inst., Waimanalo, Hawaii.
H. L. Goodwin, and J. A. Hanson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 657, Price codes: A05 in paper copy, A01 in microfiche. Report to NOAA Sea Grant Program, (1975). 95 p, 6 append.

Descriptors: Fish, *Shellfish, *Crustacean, *Freshwater fish, *Aquiculture, Seafood, Aquatic animals, Marine Biology, Aquatic biology, Fisheries, Larvae, Shrimp, Food consumption.
Identifiers: *Prawns, Freshwater prawns, *Malaysian prawns, Giant malaysian prawns, Macrobrachium species, Macrobrachium rosenbergii, Juvenile prawns, Prawn diseases, Prawn culture, Crustacean culture, Prawn fisheries, Shrimp industry.

This publication is a summary of proceedings, augmented by material from other sources, of the Workshop on the Culture of Freshwater Prawns held November 25 and 26, 1974, in St. Petersburg, Florida. This publication has two main purposes: to summarize the state of development, in the United States, of aquaculture of the freshwater prawn, with particular emphasis on the long-legged giant Malaysian prawn, Macrobrachium rosenbergii; and to begin compilation of institutions, companies, and persons engaged in some aspect of prawn research and culture so that communication among persons and organizations with comparable interests may be accelerated. Some of the areas covered in the report are: Malaysian prawn breeding, juvenile prawns, feeding cultured prawns, diseases of freshwater prawns, prawn culture systems, proceeding and marketing of prawns, and the economics of prawn culture. (Katz)
W77-02209

SANITARY-HYGIENIC EVALUATION OF THE RECYCLED WATER SUPPLY ON RAILROADS, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Zheleznodorozhnoi Gigieny, Moscow (USSR).
I. P. Ovchinkin, A. M. Lakshin, O. I. Gribanov, V. A. Gaponova, and A. A. Styazhkina.
Gig Sanit 8, p 85-86, 1975.

Descriptors: *Public health, *Recycling, Water supply, Water reuse, *Railroads.

At railroad enterprises, a closed wastewater circulation system can eliminate waste discharge into water bodies. The train washing process is reorganized.--Copyright 1976, Biological Abstracts, Inc.
W77-02241

WASTEWATER REUSE-INDUSTRIAL, MUNICIPAL, OR BOTH,
Maintenance Engineering Corp., Houston, Tex.
For primary bibliographic entry see Field 5D.
W77-02358

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: CANE SUGAR REFINING,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5D.
W77-02414

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE FABRICATED AND RECLAIMED RUBBER SEGMENT OF THE RUBBER PROCESSING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D. C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5D.
W77-02415

ECONOMIC EFFECTS OF ENFORCEMENT VARIABLES ON COMMERCIAL OIL POLLUTION CONTROL STRATEGY,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 5G.
W77-02418

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE FORMULATED FERTILIZER SEGMENT OF THE FERTILIZER MANUFACTURING, POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5D.
W77-02419

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE PRIMARY ALUMINUM SMELTING SUBCATEGORY OF THE ALUMINUM SEGMENT OF THE NONFERROUS METALS MANUFACTURING, POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D. C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5D.
W77-02421

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: THE TEXTILES, FRICTION AND SEALING MATERIALS SEGMENT OF THE ASBESTOS MANUFACTURING INDUSTRY,
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W77-02422

ENERGY DEVELOPMENT: THE ENVIRONMENTAL TRADEOFFS. VOL. 2: RELATIVE ENVIRONMENTAL ASSESSMENT OF METHODS TO INCREASE ENERGY PRODUCTION, CRUDE OIL, PIPELINE QUALITY GAS, AND ELECTRICITY FROM WESTERN COAL,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 6G.
W77-02423

INTERNATIONAL SEABED REGIME: INDIA'S INTERESTS AND POLICY OPTIONS,
Lucknow Univ. (India).
For primary bibliographic entry see Field 6E.
W77-02424

ENERGY FROM COAL.
Tetra Tech, Inc., Arlington, Va.
For primary bibliographic entry see Field 6D.
W77-02430

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES FOR SEAFOOD PROCESSING INDUSTRY: (FISH MEAL, SALMON, BOTTOM FISH, CLAMS, OYSTERS, SARDINES, SCALLOPS, HERRING, ABALONE),
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5D.
W77-02433

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: BEET SUGAR INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5D.
W77-02434

ENVIRONMENTAL ASPECTS OF CHEMICAL USE IN PRINTING OPERATIONS, (SEPTEMBER 22-24, 1975, KING OF PRUSSIA, PA.), CONFERENCE PROCEEDINGS.
Environmental Protection Agency, Washington, D. C. Office of Toxic Substances.
For primary bibliographic entry see Field 5C.
W77-02553

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE PLYWOOD, HARDBOARD AND WOOD PRESERVING SEGMENT OF THE TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D. C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W77-02554

HYPERFILTRATION FOR RENOVATION OF TEXTILE FINISHING PLANT WASTEWATER,
La France Industries, S. C.
For primary bibliographic entry see Field 5D.
W77-02557

CHLORIDES IN THE KRAFT RECOVERY SYSTEM. I. CHLORIDES IN THE RECOVERY BOILER, AND A MECHANISM FOR CHLORIDE REMOVAL,
Swedish Forest Products Research Lab., Stockholm.
For primary bibliographic entry see Field 5D.
W77-02559

CHLORIDES IN THE KRAFT RECOVERY SYSTEM. II. PROCESS AND EQUIPMENT ASPECTS ON A CLOSED BLEACHED KRAFT MILL,
Finnish Pulp and Paper Research Inst., Helsinki.
For primary bibliographic entry see Field 5D.
W77-02560

EFFLUENT-FREE BLEACHED KRAFT PULP MILL. VIII. BLEACH PLANT RENOVATION AND DESIGN,
Erco Envirotech Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5D.
W77-02562

3F. Conservation In Agriculture

MAXIMIZING STOMATAL CONTROL AND ROOT SYSTEM TO OPTIMIZE WATER-USE EFFICIENCY IN SOYBEANS,
Kansas Water Resources Research Inst., Manhattan.
I. D. Teare.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 395, Price codes: A05 in paper copy, A01 in microfiche. Completion Report, KWRRI Contribution No. 180, (1976). 100 p. OWRT A-060-KAN(1). 14-34-0001-6017.

Descriptors: *Soybeans, Soil water, *Stomata, *Root systems, *Root distribution, Root development, Soil profiles, Sorghum, Soil moisture, Irrigation practices, Plant growth.
Identifiers: Available soil water, Soil water potential, Leaf water potential, Leaf area index, Physiological stage, Dry matter, Stomatal resistance, *Nitrate reductase activity.

Soybean and grain sorghum roots have been studied in relation to rate of root extention, rooting depth, dry matter distribution in the soil profile, soil water use and flux, and physiological stages of development under irrigated and nonirrigated conditions. Soybean roots reached a depth of 160 cm in a barrier-free soil 15 1/2 weeks after planting date in both irrigated and nonirrigated treatments. A greater proportion of nonirrigated soybean roots were at deeper depths than the irrigated sorghum roots. Sorghum roots reach maximum depth (150 cm) much quicker than soybean roots (7 weeks after planting date). Soil moisture inventories showed that sorghum conserves soil moisture early in the season, a phenomenon related to stomatal resistance. Soybeans, on the other hand, transpire more water and extract more water from the soil than grain sorghum. The greater negative flux of water in soybeans late in the season helps explain their using more water than sorghum. Stomatal resistance values of 8 to 10 sec/cm occur after nitrate reductase activity decreases and before photosynthesis is reduced, so stomatal resistance may be useful for scheduling irrigations in soybeans and sorghum.
W77-02077

DRIP IRRIGATION FILTRATION PROBLEMS AND RESEARCH,
Controlled Water Emission Systems, El Cajon, Calif.
D. L. Wilson.
Sprinkler Irrigation Association, 1975 Annual Technical Conference Proceedings, Hyatt-Regency Hotel, Atlanta, Georgia, February 23-25, 1975. p 51-57, 4 ref.

Descriptors: Irrigation water, Irrigation, Irrigation systems, Filtration, Filters, Water quality, *Irrigation practices.
Identifiers: *Drip irrigation, *Trickle Irrigation.

One of the major concerns in drip irrigation is filtration. Proper filtration makes the difference between an effective drip installation and one that is ineffective with many problems and poor efficiency. The drip filtration problem is examined and defined. Existing equipment and processes to treat the filtration requirement are reviewed. Some of the equipment and processes under development are discussed. (Skogerboe-Colo St)
W77-02090

DRIP IRRIGATION PROGRESS AND PROBLEMS,
California Univ., Parlier. San Joaquin Valley Agricultural Research and Extension Center.
F. K. Aljibury.
In: Sprinkler Irrigation Association, 1975 Annual Technical Conference Proceedings, p 46-47, Hyatt-Regency Hotel, Atlanta, Georgia, February 23-25, 1975.

Descriptors: Irrigation, Irrigation methods, *Irrigation practices, Water conservation.
Identifiers: *Drip irrigation, *Trickle irrigation.

Most drip irrigation installations in California and elsewhere, were made to solve specific problems of water cost, water shortage, soil conditions, labor expense and automated water delivery. The acceptance of this method would have been limited, however, without favorable crop response, production, and favorable costs. Field experience shows that drip irrigation is most advantageous under conditions marginal for other methods of water application. (Skogerboe-Colo St)
W77-02091

THE FUTURE OF AUTOMATED SPRINKLER IRRIGATION SYSTEMS,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
W. E. Splinter.
In: Sprinkler Irrigation Association, 1975 Annual Technical Conference Proceedings, Hyatt-Regency Hotel, Atlanta, Georgia, February 23-25, 1975. p 42-45, 8 ref.

Descriptors: *Sprinkler irrigation, *Automatic control, *Automation, Irrigation, *Irrigation practices, Irrigation efficiency.

Sprinkler irrigation, especially automated forms of sprinkler irrigation, will play a key role in supplying the U.S. with adequate food resources to meet the expanding demands internally and to provide diplomatic and balance-of-trade impact on the international scene. As menial labor to provide shovel work for irrigation becomes increasingly scarce, there will be continued pressures to increase initial investment to automate irrigation. (Skogerboe-Colo St)
W77-02092

IRRIGATION SCHEDULING FOR ENERGY AND WATER CONSERVATION,
Agricultural Research Service, Fort Collins, Colo.
D. F. Heermann.
In: Sprinkler Irrigation Association, 1975 Annual Technical Conference Proceedings, Hyatt-Regency Hotel, Atlanta, Georgia, February 23-25, 1975. p 7-13, 2 fig, 14 ref.

Descriptors: *Water conservation, *Energy, *Scheduling, Sprinkler irrigation, Surface irrigation, *Water conservation.
Identifiers: *Irrigation scheduling.

Many irrigation scheduling schemes have been developed to help the irrigator conserve water and increase yields. The more complex schemes have been shown to conserve considerable amounts of water and energy. However, even the simpler schemes must not be overlooked since they also are good management tools. The benefits of irrigated agriculture in food production will undoubtedly force continued irrigation development throughout the world. (Skogerboe-Colo St)
W77-02093

SPRINKLERS FOR MULTIPLE USE,
M. Hagood.
Irrigation Age, Vol. 9, No. 8, p 11-12, May-June 1975.

Descriptors: *Sprinkler irrigation, Irrigation, Irrigation systems, *Irrigation practices, Fertilization.

Multiple use for full utilization of natural resources has been popular for several years. The multiple use concept for irrigation systems can also be beneficial. Besides nonagricultural uses of sprinkler systems, there are many production aspects which provide potentially better utilization. These include the fertilizer, soil amendment and pesticide application, and climate control. And, although single line systems can be used for purposes other than irrigation, the real dividends come when systems are automated. Solid sets and center pivots, particularly, lend themselves to sophisticated and extra dividend benefits. Multiple purpose systems make it possible to save labor, material, and energy by requiring fewer trips across the field with machinery and by timely chemical application. (Skogerboe-Colo St)
W77-02095

A NEW TECHNIQUE FOR CONSERVING WATER,
A. Humpherys.
Irrigation Age, Vol. 9, No. 7, p 24-25, April 1975.

Descriptors: *Water conservation, Irrigation, Irrigation systems, Irrigation efficiency, *Irrigation practices.

As our knowledge of soils and plants increases and as we learn more about the effects of the field environment and cultural treatments on plant growth and production, we will need to modify present tillage, irrigation, and cultural practices to take advantage of new concepts. A practice getting recent attention consists of using short, frequent irrigations which vary from daily irrigations to irrigating every two or three days. (Skogerboe-Colo St)
W77-02097

COMPUTER IRRIGATION,
Irrigation Journal, Vol. 25, No. 5, p 14-15, September-October 1975.

Descriptors: Irrigation, Scheduling, Computers, *Computer programs, Irrigation practices, Colorado, Crop production.
Identifiers: *Irrigation scheduling.

When to irrigate and how much water to use on crops are decisions which will be made by computer during the current growing season for a test group of cooperating farmers in western and southeastern Colorado. The farmers are part of a computer-controlled irrigation program being conducted by the U. S. Interior Department's Bureau of Reclamation. Program Coordinator Jerry Buchheim is in charge of the project, which is monitored by the bureau's giant Control Data CYBER 74 computer at the Federal Center in Denver. (Skogerboe-Colo St)
W77-02098

OPTIMIZATION OF WATER USE EFFICIENCY UNDER HIGH FREQUENCY IRRIGATION--I. EVAPOTRANSPIRATION AND YIELD RELATIONSHIP,
New Mexico State Univ., University Park. Dept. of Agricultural Engineering.
T. A. Howell, and E. A. Hiler.
Transactions of the American Society of Agricultural Engineers, Vol 18, No 5, p 873-878, September-October 1975. 2 fig, 5 tab, 20 ref.

Descriptors: *Irrigation, *Irrigation efficiency, *Irrigation practices, Irrigation systems, *Evapotranspiration, *Crop response, *Grain sorghum, Irrigation effects, Lysimeters, Moisture stress, Water utilization.
Identifiers: High frequency irrigation, *Drip irrigation, *Trickle irrigation.

An experiment was conducted in 1973 to determine the sensitivity of grain sorghum to water deficits in three selected growth stages under high frequency irrigation. Field lysimeters containing undisturbed soil cores were utilized. Rainfall was removed as a variable by an automatic shelter system. Irrigation treatments consisted of a well-watered control, a variable level of deficit in all three growth periods (SDI treatment), and six additional treatments were irrigated three times per week. Measurements were made to determine irrigation amount, storage depletion, and drainage amount; hence total crop water use could be determined. Three empirical yield models (two multiplicative type and one additive type) were compared to the experimental data. All of these models were quite similar in formulation and represented the experimental data accurately within the range of the data. (See also W76-01083) (Skogerboe-Colo St)
W77-02103

RELATIVE IMPORTANCE OF SOIL RESISTANCE AND PLANT RESISTANCE IN ROOT WATER ABSORPTION,
Agricultural Research Service, Florence, S. C. Southern Region.
For primary bibliographic entry see Field 2D.
W77-02118

EXPERTS CLING TO WATER MYTHS,
M. Muller.
New Scientist, Vol. 70, No. 1006, p 692-693, June 24, 1976.

Descriptors: *Irrigation practices, *Flood irrigation, *Furrow irrigation, *Irrigation systems, *Irrigation efficiency, Irrigation, Irrigation effects, Water policy, Clays, Root zone, Impervious soils, Soil moisture, Soil types, Social values, Agriculture, Rural areas, Planning, *Institutional constrainrs.
Identifiers: *Sudan.

Experts often cite peasants' conservatism as a barrier to rural improvements. However, in the Sudan the conservatism of the experts in the face of adaptability by peasant farmers now jeopardizes the success of a major new irrigation project. The irrigation procedures recommended by irrigation agronomists are compared with the ways in which local farmers have adapted their own traditional irrigation methods. The Gezira irrigation project has been very successful in increasing agricultural production, but there is conflict as to which is the most efficient system of irrigation for this region. The farmers use a system of continuous irrigation. Unsupervised flood irrigation is not highly regarded by experts, but the farmers have adapted their method to the predominant soil type. The clay soil cracks when dry, providing a path for moisture to penetrate the root zone. On saturation, swelling closes the cracks. Overwatering is immediately evidenced by flooding. This method has resulted in reducing the time necessary to irrigate. Even though the local farmers' method of irrigation may be more efficient, the procedures recommended by agricultural experts will be adopted by government planning agencies. (Jamail-Arizona)
W77-02120

EFFECT OF ABSCISIC ACID AT DIFFERENT LEVELS OF SOIL WATER POTENTIAL ON THE TRANSPIRATION OF ZEA MAYS,
Aarhus Univ. (Denmark). Inst. of Plant Physiology.
For primary bibliographic entry see Field 3B.
W77-02121

FLOW CONTROL AND TRANSIENTS IN THE CALIFORNIA AQUEDUCT,
California State Dept. of Water Resources, Sacramento. Div. of Operations and Maintenance.
For primary bibliographic entry see Field 8B.
W77-02136

SEEPAGE FROM TRAPEZOIDAL CANAL IN ANISOTROPIC SOIL,
Indian Inst. of Science, Bangalore. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W77-02137

WATER MANAGEMENT OF SHORT-SEASON HIGH-DENSITY COTTON,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
R. A. Mohammed.
Master of Science Thesis, 1975. 89 p, 1 fig, 4 tab, 36 ref.

Descriptors: *Water management(Applied), *Cotton, *Soil moisture, *Crop production, Fiber crops, Soils, Soil profiles, Soil water, Irrigation, Irrigation operation and maintenance, Arid lands, Moisture stress, Nitrogen compounds, Fertilizers.

Water management of cotton was studied for three seasons at the University of Arizona Experimental Farm near Tucson. Various irrigation schedules and nitrogen fertilizer application rates were examined, and data were collected on amounts of water applied, yield, boll, and fiber properties, soil nitrate levels and cotton petiole nitrate levels. Two varieties of cotton, Anderson-Clayton 1764 and Deltapine 16, were planted. Deltapine 16 was the only variety planted in 1973 and 1974. The 1972 experiment showed that Deltapine 16 was better suited to the short-season, high-density cotton production system than Anderson-Clayton 1764. The 1973 and 1974 experiments indicated that available soil moisture depletion should not exceed 50-55 percent. Also, criteria (based on available soil moisture) of when to irrigate should not be varied throughout the season. Results suggest that yields can be maintained with early irrigation termination if soil moisture, before irrigation, is kept at a higher level than is the normal practice. Application of 100 pounds of Nitrogen per acre seemed to adequately meet the crop's needs for the season. (Jamail-Arizona)
W77-02164

THE ECONOMICS OF PRESSURIZED IRRIGATION SYSTEMS FOR MATURE CITRUS ORCHARDS IN SOUTHWESTERN ARIZONA,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
P. Wilson, R. W. Fox, and G. S. Willett.
Publication No. 14, 1976. 76 p, 3 fig, 24 tab, 10 ref, 5 append.

Descriptors: *Citrus fruits, *Irrigation efficiency, *Irrigation systems, *Costs, *Irrigation practices, Irrigation districts, Irrigation operation and maintenance, Crops, *Arizona, Irrigation, Irrigated land, Furrow irrigation, Flood irrigation, Water quality, Water costs.
Identifiers: *Pressurized Irrigation Systems.

An economic comparison of alternative irrigation systems for mature citrus orchards in the Wellton Mesa area of Arizona is presented. Investments, operating costs, returns, liquidity and profitability of drip, bubbler and spray systems are analyzed relative to conventional flood irrigation. Data obtained through interviews with citrus producers in the area included crop yields, irrigation techniques utilized, inventory of irrigation facilities and equipment, amount and timing of fertilizer water applied, methods and materials used to control weeds, and labor requirements. Additional information on conventional flood irrigation was obtained from the University of Arizona, the Soil Conservation Service, and the Wellton-Mohawk Irrigation and Drainage District. Results indicate that pressurized irrigation systems are the most efficient: water is delivered to the root area of each tree in the quantity needed to sustain productive growth. The costs of installation and operation of this type of irrigation system are analyzed. (Jamail-Arizona)
W77-02165

RATIONAL WATER PRICING IN THE TUCSON BASIN,
Arizona Univ., Tucson. Coll. of Business and Public Administration.
For primary bibliographic entry see Field 6D.
W77-02170

WATER FLOW IN WHEAT SEEDLINGS AFTER SMALL WATER DEFICITS,
Lund Univ. (Sweden). Dept. of Plant Physiology.
For primary bibliographic entry see Field 2D.
W77-02172

INFLUENCE OF DIFFERENT WATER REGIMES ON OXYGEN DIFFUSION RATES, NUTRIENT UPTAKE, GROWTH AND YIELD OF WHEAT,
Indian Agricultural Research Inst., New Delhi.

A. K. Sharda, and J. P. Gupta.
Annals of Arid Zone, Vol. 14, No. 4, p 373-375, December, 1975. 1 tab.

Descriptors: *Soil moisture, *Moisture stress, *Moisture availability, *Moisture uptake, *Moisture tension, Stress, Tension, *Wheat, Nutrients, Root systems, Crop response, Crop production, Heat conductivity, Soils, Oxygen, Irrigation effects, Soil-Water-Plant Relationships, Aeration.

A pot culture experiment using Delhi sandy loam soil was conducted to study oxygen diffusion, nutrient utilization, growth and yield of wheat as affected by different water regimes. Soil moisture was maintained by irrigating the soil to field capacity. In each pot, four plants were maintained. Fertilizers were applied and periodic observations of height, number of tillers and leaf area were taken during the growth of the crop. Oxygen diffusion rate in the soil was measured. Results indicate an increase in oxygen diffusion rate with increase in soil moisture tension. it can also be inferred that under high moisture regime conditions where there is practically no moisture stress, the conditions are favorable for proper oxygen diffusion, nutrient availability, root and shoot growth and ultimately the yield of the crop. (Jamail-Arizona)
W77-02177

PHYSICAL AND ECONOMIC EFFECTS ON THE LOCAL AGRICULTURAL ECONOMY OF WATER TRANSFER TO CITIES,
Economic Research Service, Fort Collins, Colo. Natural Resource Economics Div.
For primary bibliographic entry see Field 6B.
W77-02190

HE'S AUTOMATING DEAD LEVEL IRRIGATION,
R. Ross.
Irrigation Age, Vol. 9, No. 6, 3 pages, March 1975.

Descriptors: *Surface irrigation, *Furrow irrigation, Irrigation, Irrigation practices, *Irrigation efficiency, *Automation.

Dana Fisher is an enthusiastic innovator. Almost before researchers have put their tentative stamp of approval on an applicable development, it's at work in a big way on Fisher's 6,000-acre Palo Verde Valley farm. It's that type of non-traditionalism that created Fisher's open-ditch system of automated irrigation on dead level fields. Labor and water savings triggered the 160-acre development. (Skogerboe-Colo St)
W77-02195

'TUNING IN' SAVES WATER, BOOSTS YIELDS ON SANDY SOILS,
R. Ross.
Irrigation Age, Vol. 10, No. 3, p 18-20, November-December 1975.

Descriptors: Irrigation, Irrigation efficiency, Irrigation water, Sprinkler irrigation, Scheduling, Water conservation, Sands.
Identifiers: Center pivot irrigation, *Irrigation scheduling.

Any irrigator who can get more yield while using less water is on the right track to higher profits. Bill Condon, Sterling, Colorado rancher/farmer, has been in that desired position for three years. By using an irrigation scheduling program developed by Dr. Dale Heermann, and other Agricultural Research Service colleagues, stationed at Ft. Collins, Colorado, Condon has been able to get consistent yield increases (yields are now between 150 and 160 bushels of corn per acre). Water usage has dropped by about 6 inches per year, and that, says Condon, 'adds a year of life to a center pivot every 5 years because we save about 7 revolutions per year.' (Skogerboe-Colo St)
W77-02196

THE IRRIGATOR'S COUNSELOR,
G. Schleicher.
Irrigation Age, Vol. 10, No. 1, p 20-26, October 1975.

Descriptors: Energy, *Water conservation, *Irrigation, Scheduling, Sprinkler irrigation, *Irrigation efficiency.
Identifiers: Irrigation scheduling.

In summer 1975, over 400 High Plains farmers improved their fertility programs, upgraded their irrigation efficiency, and reduced weed, insect and disease problems without spending a single extra hour in the field, by hiring a professional consulting firm at McCook, Nebraska, to solve their management problems. (Skogerboe-Colo St)
W77-02197

COMPARING THREE MECHANICAL MOVE SPRINKLERS WITH GATED PIPE,
Irrigation Age, Vol. 9, No. 8, p 28-29, May-June 1975.

Descriptors: *Sprinkler irrigation, *Furrow irrigation, Irrigation, Irrigation systems, Pipes, Distribution systems.
Identifiers: *Gated pipe(Irrigation).

Paul Fischbach, University of Nebraska extension irrigationist, spelled out the positive sides of mechanical move sprinklers vs. gated pipe during the Sprinkler Irrigation Association's annual technical conference in Atlanta. (Skogerboe-Colo St)
W77-02198

MAKING SURFACE IRRIGATION WORK WITH AUTOMATION,
R. Alleman.
Irrigation Age, Vol. 9, No. 7, p 38-39, April 1975.

Descriptors: *Surface irrigation, *Furrow irrigation, Irrigation, Water conservation, Irrigation efficiency, Irrigation systems, *Automation.

Nebraska farmers Ed Thieszen and Ted Regier have moved to irrigation systems that cut labor to the minimum, save water, and may increase corn yields. Both have installed automatic surace systems. (Skogerboe-Colo St)
W77-02199

HERBICIDES AND SURFACE IRRIGATION-DO THEY MAKE A TEAM,
G. Schleicher.
Irrigation Age, Vol. 9, No. 5, p 42, February 1975.

Descriptors: *Herbicides, *Surface irrigation, *Furrow irrigation, Irrigation, Irrigation practices, Water pollution control.
Identifiers: *Center pivot irrigation.

Herbigation through center pivot sprinkler irrigation works; that's the consensus of a growing number of irrigation specialists and irrigating farmers who have put the concept to use on a surprising variety of crops. But what about the surface irrigator, the operator who uses gated pipe or an open ditch to deliver water to his fields. Can herbicides be applied as efficiently at ground level as they are through a sprinkler nozzle. The solution to these questions have been the target of several private and university studies in the last year or two. While conclusive results are still somewhat sketchy, it's beginning to look like surface herbigation may eventually take a place in the irrigating farmer's stack of management tools. (Skogerboe-Colo St)
W77-02200

HERBIGATION,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
P. E. Fischbach.
Irrigation Journal, Vol. 25, No. 3, p 22-24, May-June 1975.

Descriptors: *Herbicides, Irrigation, *Irrigation practices, Irrigation systems, Irrigation efficiency, Crop production.
Identifiers: *Herbigation.

Herbigation is the science of applying herbicides through an irrigation system. It's a new way to save food production costs and labor. (Skogerboe-Colo St)
W77-02201

INITIAL RELEASE OF NITROGEN FROM UREAFORM UNDER FIELD CONDITIONS,
Agricultural Research Organization, Bet-Dagan (Israel). Inst. of Soils and Water; Agricultural Research Organization, Bet-Dagan (Israel). Div. of Soil Chemistry and Plant Nutrition.
A. Hadas, U. Kafkafi, and A. Peled.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1103-1105, November-December 1975. 3 fig, 2 tab, 10 ref.

Descriptors: *Nitrogen, *Nitrites, Nutrients, Crop response, Fertilizers, Fertilization, Ureas, Mineralogy.
Identifiers: *Bananas, *Ureaform.

The mineralization of ureaform in the soil has been observed during the three weeks following application in a small plot of a banana plantation at two different seasons of the year. In the cooler season ammonium and nitrite accumulated and persisted for 2 weeks. In the warmer season, only ammonium accumulated during 2 days. The rate of mineralization, calculated as a first-order reaction, was greater at the higher temperature, but the rate constants were about 10 times greater in the field than in previous laboratory experiments. The reasons for this are probably changes in microbiological activity and mineralization of nitrogen from sources other than the fertilizer. (Skogerboe-Colo St)
W77-02279

CROP PRODUCTION FUNCTION DETERMINATIONS AS INFLUENCED BY IRRIGATION AND NITROGEN FERTILIZATION USING A CONTINUOUS VARIABLE DESIGN,
North Dakota State Univ., Fargo. Dept. of Soil Science and Biometerology.
J. W. Bauder, R. J. Hanks, and D. W. James.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1187-1192, November-December 1975. 3 fig, 6 tab, 16 ref.

Descriptors: *Irrigation, *Irrigation effects, *Nitrogen, *Nutrients, Fertilizers, Fertilization, *Crop production, Soil water, Moisture stress.
Identifiers: *Continuous function designs.

Continuous variable (CVD) and randomized block, split plot (RBSD) designs were used to produce data from which production functions were developed relating corn yield to soil water and nitrogen fertilizer. Data were collected at Logan, Utah in 1972 and Farmington, Utah in 1973. The CVD water and nitrogen treatments, respectively, were sequential or continuous and not randomized. The design is compact but has some statistical uncertainty. The CVD had 7 or 8 soil water (W) levels and 22 or 24 nitrogen (N) levels compared to 4 W and 5 N levels for RBSD. The area used for the RBSD was 3 or 4x that used for the CVD. The data analyzed for the CVD led to the same conclusions as the analysis of the RBSD. The production function (regression equation) at Logan was different from that at Farmington except when comparisons were made on a relative basis. (Skogerboe-Colo St)
W77-02281

EFFECT OF LIME ON BORON TRANSPORT TO AND UPTAKE BY COTTON,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
H. D. Scott, S. D. Beasley, and L. F. Thompson.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1116-1121, November-December 1975. 3 fig, 5 tab, 22 ref.

Descriptors: *Boron, *Cotton, *Crop response, Soils, Soil investigations, Soil chemistry, Moisture stress, Adsorption, Diffusivity, *Lime, *Absorption, Path of pollutants.

Deficiencies of Boron have occurred in cotton grown in coarse textured soils during periods of moisture stress and in those soils which have been recently limed. These B deficiencies have generally been attributed to a decrease in soil B availability to cotton. As a result a greenhouse experiment was conducted to study (1) the amounts of adsorption and diffusivity rates of B in two silt loams and (2) B adsorption by cotton grown in pots. Addition of lime increased B adsorption by both a Taloka silt loam and a Calloway silt loam. Maximum B adsorption occurred on the seventh day after its addition but did not differ appreciably from the one day equilibration time. The adsorption data could not be accurately described by the Langmuir adsorption equation. (Skogerboe-Colo St)
W77-02282

SOIL CHANGES RESULTING FROM CROPPING,
Agricultural Research Service, Manhattan, Kans.
For primary bibliographic entry see Field 2G.
W77-02284

EFFECT OF DEGREE OF SOIL PROFILE DISRUPTION ON PLANT GROWTH AND SOIL WATER EXTRACTION,
Academy of Agricultural Sciences, Sofia (Bulgaria). Inst. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-02286

NUTRIENT DILUTION-ANTAGONISM EFFECTS IN CORN AND SNAP BEANS IN RELATION TO RATE AND SOURCE OF APPLIED POTASSIUM,
National Fertilizer Development Center, Muscle Shoals, Ala.
G. L. Terman, S. E. Allen, and B. N. Bradford.
Soil Science Society of America Proceedings, Vol. 39, No. 4, p 680-685, July-August 1975. 6 fig, 2 tab, 12 ref.

Descriptors: *Corn(Field), *Beans, *Crop response, *Potassium, *Nutrients, Fertilization, Crop production, Fertilizers.

Greenhouse pot experiments were conducted to compare responses of corn and snap beans to 0 to 1,600 mg of K/pot as KNO3, KC1, and K2SO4 on K-deficient soils (3 kg of soil/pot). Marked responses were obtained to applied K, which were similar among sources, except for a toxic salt effect of 1,600 mg of K as KC1. Marked reciprocal K-N, K-P, K-Ca, and K-Mg relationships with yield response to rates of applied K were attributed to both dilution and ion antagonism. (Skogerboe-Colo St)
W77-02288

ECONOMIC IMPACTS OF WEATHER VARIABILITY,
Missouri Univ., Columbia. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 3B.
W77-02429

IRRIGATING SOYBEANS WITH LIMITED WATER,
Kansas Agricultural Experiment Station, Manhattan. Evapotranspiration Lab.
L. R. Stone, W. L. Powers, and C. D. Nickell.
Kansas Water Resources Research Institute Contribution Number 158. Kansas Agricultural Experiment Station Bulletin, Keeping Up With Research 18, March 1975. 3 p, 1 fig, 4 tab. OWRT A-069-KAN(2). 14-31-0001-5016.

Descriptors: Growth stage, *Soybeans, *Irrigation practices, *Soil moisture, Crop production, Soil water.
Identifiers: *Soybean lodging, *Limited irrigation, Soil-moisture depletion.

During the past three years soybean yields and lodging as influenced by irrigation amount and time were evaluated. The results should help irrigators who want to use less water because of limited water supply, limited pumping capacity, limited time, increased cost of fuel for pumping, or other reasons. The 3 years of data indicate that full-season irrigation does not increase soybean yields, but increases lodging over soybeans irrigated only during pod formation and filling (bean development). Limited in-season irrigation is most practical in soils with large water-holding capacity and nothing to restrict extensive root development; and if a moderate to large amount of soil water is stored before planting.
W77-02523

DRIP IRRIGATION INCREASES YIELD AND SIZE OF 'SUNRICH' NECTARINES,
Florida Univ., Gainesville. Dept. of Fruit Crops.
J. F. Bartholic, and D. W. Buchanan.
Proceedings of the Florida State Horticultural Society, Vol 88, p 509-511, 1975. 1 fig, 1 tab, 10 ref. OWRT B-014-FLA(7). 14-31-0001-3868.

Descriptors: Evapotranspiration, Evapotranspiration control, Energy budget, Oranges, Water balance, Crop production, Orchards, Fruit crops.
Identifiers: Drip irrigation.

A 'Sunrich' nectarine orchard was established in 1972 with drip irrigation on 2/3 of the orchard with 1 emitter per tree and permanent overhead irrigation on the remaining 1/3. Drip irrigation required about 1/3 less water during the first 3 years of the experiment. Tree growth during this period was similar; however, root studies show there was a difference in rooting patterns between drip and overhead irrigation. Roots were concentrated between 6 and 24 inches in the soil under drip irrigation and in the top ft. where overhead irrigation supplemented rainfall. Even with only 3 gal per day applied to trees during the 1975 fruiting season, there were significant increases in yield and fruit size with drip irrigation. (Morgan-Florida)
W77-02541

SPRAY IRRIGATION OF WASTE WATER ON CITRUS GROVES,
Agricultural Research and Education Center, Lake Alfred, Fla.
For primary bibliographic entry see Field 5D.
W77-02544

A BIOECONOMIC SIMULATION ANALYSIS OF REGULATING GROUNDWATER IRRIGATION,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Economics.
H. P. Mapp, Jr., and V. R. Eidman.
American Journal of Agricultural Economics, Vol. 58, No. 3, p 391-402, August 1976. 1 fig, 6 tab, 25 ref. OWRT A-057-OKLA(1). 14-01-0001-1539.

Descriptors: *Irrigation, *Crops, *Yield equations, *Simulation analysis, *Stochastic processes, *Regulation, *Groundwater, Economics, Water allocation(Policy), Soil water, Soil moisture, Pumping, Decision making, Farm, Income, Water policy, Evaluation, Systems analysis, Great Plains.
Identifiers: *Ogallala Formation(Great Plains), *Bioeconomic model, Dryland crops, Marginal private costs, Marginal social costs.

Developed is a firm-level bioeconomic simulation model capable of stochastically determining yields for the major dryland and irrigated crops in the central basin of the Ogallala Formation as a function of soil moisture and atmospheric stress during critical stages of plant development. The Ogallala Formation is a major unconsolidated aquifer providing irrigation water for much of the Great Plains. The model presented is used to evaluate three methods of regulating groundwater irrigation: no restriction; a quantity limitation; and a graduated tax per unit above the quantity limitation. Results differ for poor and adequate water situations but indicate the potential value of an educational program on timing of irrigation application to maximize net farm income. (Bell-Cornell)
W77-02549

EVAPOTRANSPIRATION MODEL TESTED FOR SOYBEAN AND SORGHUM,
Kansas State Univ., Manhattan. Dept. of Agronomy.
For primary bibliographic entry see Field 2D.
W77-02550

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

A MODEL FOR PREDICTING FLOOD HAZARDS DUE TO SPECIFIC LAND-USE PRACTICES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-02078

WHAT'S IN THE FUTURE FOR SPRINKLER IRRIGATION,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
W. E. Splinter.
Irrigation Age, Vol. 9, No. 6, p 26, p 30, March 1975.

Descriptors: Irrigation, *Sprinkler irrigation, *Irrigation practices, Irrigation systems.

Man's recognition of the need for water for plants appears nearly as old as agriculture. Ancient works in Asia Minor indicate that quite complex irrigation systems were developed several thousand years ago. Many of the ancient systems are still in use. The use of external energy to move water appeared first with the use of wind powered pumping plants. Since its inception irrigation has required high inputs of effort and management. (Skogerboe-Colo St)
W77-02096

ARIZONA'S FROZEN ASSETS: SNOWPACK MANAGEMENT,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 2C.
W77-02106

MANAGING THE SOUTHWESTERN NATIONAL FORESTS FOR WATER AND RELATED RESOURCES,
Forest Service (USDA), Washington, D. C.
J. R. McGuire.
19th Annual Arizona Watershed Symposium Proceedings, Report No. 7, p 35-36, September 1975.

Descriptors: *National forest, *Southwest U.S., *Forest management, *Watershed management, *Water yield improvement, *Water quality standards, *Herbicides, Natural resources.

National forest management in the Southwest is discussed with regard to legal guidelines, policy-making and research on water and related resources of forest land. Two basic principles of National Forest Management issued in the 1950's are still applicable: protection of the watershed by stabilizing the soil and thereby preserving and enhancing water quality; and management of the area to improve water yields. Multiple use management accounts for timber production, recreation, grazing and wildlife as priorities equal to water yield. Watershed management studies and their benefits are briefly discussed; in Arizona alone, $10 million in public and private funds has been spent on such projects. Problems described include the meeting of water quality standards, the cost of increasing water yields, and the impact of chemical herbicide restrictions on water yield improvement programs. Future watershed management studies and programs are discussed. (See also W77-02104) (Jahns-Arizona)
W77-02107

ARIZONA'S FROZEN ASSETS: VOLUMETRIC FORECASTS FROM SNOWPACK,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 2C.
W77-02108

DROUGHT HAZARD IN THE UNITED STATES: A RESEARCH ASSESSMENT,
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 3B.
W77-02113

LAW, HYDROLOGY, AND SURFACE-WATER SUPPLY IN THE UPPER COLORADO RIVER BASIN,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
For primary bibliographic entry see Field 6E.
W77-02119

AN ANALYSIS OF THE EFFECTS OF PARAMETER UNCERTAINTY IN DETERMINISTIC HYDROLOGIC MODELS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2A.
W77-02125

OPERATION OF A RESERVOIR COLLECTING WATER FROM A SMALL WATERSHED,
Technion - Israel Inst. of Tech., Haifa. Lowdermilk Faculty of Agricultural Engineering.
N. Buras, M. H. Diskin, and S. Zamir.
Water Resources Research, Vol. 12, No. 5, p 866-872, October 1976. 5 fig, 6 tab, 3 ref.

Descriptors: *Reservoir operation, *Optimization, *Economic efficiency, Watersheds(Basins), Operations research, Synthetic hydrology, Storm runoff, Decision making, Irrigation, Reservoir storage, Pumping, Costs, Benefits, Equations, *Small watersheds.
Identifiers: *Operating policy, *Linear control curves, Operating targets, *Cost minimization, Dalton Reservoir(Israel), Economic criteria.

Best operation policies, linear and nonlinear, were developed for a small reservoir in which storm runoff water might be augmented by pumping water from another source. These policies were aimed at a full reservoie at the beginning of the yearly irrigation season and, indirectly, utilized more efficiently the existing neighboring pumping installations, which are usually idle in winter. The operating policies are expressed as time-dependent functions indicating the level of the reservoir which would ensure its being full at the end of the rainy season with a given probability. When these policies were tested with a synthetic hydrologic series of 45 years, it appeared that the cost of operating the reservoir was inversely proportional to the daily amount of water pumped into it from external sources. (Bell-Cornell)
W77-02126

FLOW CONTROL AND TRANSIENTS IN THE CALIFORNIA AQUEDUCT,
California State Dept. of Water Resources, Sacramento. Div. of Operations and Maintenance.
For primary bibliographic entry see Field 8B.
W77-02136

THE USE OF LANDSAT DCS AND IMAGERY IN RESERVOIR MANAGEMENT AND OPERATION,
Corps of Engineers, Waltham, Mass. New England Div.
S. Cooper.
Report NASA CR-146320, Type II Progress Report No. 3, December 1, 1975. 7 p, 1 fig. NASA 22510.

Descriptors: *Remote sensing, *Maine, Equipment, *Instrumentation, Satellites(Artificial), Projects, Data processing, Water resources, Reservoirs, *Reservoir operation, Snowpacks, Computers.
Identifiers: *LANDSAT, *St John River(Maine).

On 19-25 September, two snow pillows were interfaced to DCP's in the Saint John River basin area of northern Maine to obtain real time information on the water equivalent of the snowpack. NED's direct LANDSAT DCS ground receive facility or Local User Terminal (LUT) was completely installed as of 15 September. A period of initial testing ensued, and the system was fully operational by mid-December. For the first three weeks, antenna pointing angles were transferred to the tracking equipment via paper tape, but within a short time, this was circumvented by a direct interface to out NOVA mini-computer. At the end of the reporting period, the system was operable in an automatic mode and could be left unattended overnight and during weekends. (Sims-ISWS)
W77-02151

FOURTH SEMIANNUAL INTERAGENCY BRIEFING, FEBRUARY 1975, WASHINGTON, D.C.,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 8G.
W77-02158

FLOW RECESSION IN THE EPHEMERAL STREAM,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2E.
W77-02162

APPLICATIONS OF ERTS PRODUCTS IN RANGE AND WATER MANAGEMENT PROBLEMS, SAHELIAN ZONE: MALI, UPPER VOLTA AND NIGER,
Geological Survey, Denver, Colo.
M. E. Cooley, and R. M. Turner.
Open-file report (West Africa Investigations), 1975. 68 p, 17 fig, 3 tab, 12 ref.

Descriptors: *Satellites(Artificial), *Remote sensing, *Range management, *Water management(Applied), *Africa, Environmental control, Environmental effects, Public Health, Mapping.
Identifiers: Satellite imagery, *ERTS(LANDSAT), *Sahel, *Mali, *Upper Volta, *Niger.

A field investigation was conducted during April and May of 1974 to evaluate the application of Earth Resources Technology Satellites (ERTS, now called LANDSATS) imagery to range and water management problems in the Sahelian zone. ERTS imagery was studied, then evaluated by inspecting ground features in trips by car, light plane and commercial jet airlines. The study indicates such imagery can provide general overviews of regions or entire countries and is viable in areas where ground surveys are inadequate or nonexistent. They also allow repetitive inventorying and monitoring of transient environmental changes on the earth's surface, and aid in solving special problems of disease control and resource development. Applications include riverblindness and tsetse fly control, bush-burning evaluation, distinction of arable from nonarable land, and the analysis of accelerated erosion problems. Mapping and imagery selection are discussed, and the limitations imposed by environmental conditions are described. (Jahns-Arizona)
W77-02167

WATER POLLUTION INVESTIGATION: DULUTH-SUPERIOR AREA,
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5B.
W77-02202

MAINE RIVERS BIBLIOGRAPHY- A USER'S MANUAL,
Research Inst. of the Gulf of Maine, Portland.
For primary bibliographic entry see Field 10C.
W77-02224

SOME ASPECTS OF MUNICIPAL OVERFLOW RESERVOIR MONITORING, (IN SWEDISH),
Uppsala Kommun (Sweden). Halsovard Forvaltning.
For primary bibliographic entry see Field 5A.
W77-02228

SOME HYGIENIC PROBLEMS RELATED TO THE USE OF HERBICIDES OF THE 2,4-DICHLOROPHENOXYACETIC ACID GROUP, (IN RUSSIAN),
Tomsk Meditsinskii Institut (USSR).
For primary bibliographic entry see Field 5G.
W77-02231

PARROT'S-FEATHER (MYRIOPHYLLUM AQUATICUM (VELL.) VERDC.), AN AGGRESSIVE WATER WEED IN PORTUGAL, (IN PORTUGUESE),
Estacao Agronomica National, Oeiras (Portugal).
For primary bibliographic entry see Field 5G.
W77-02247

SANITARY-HYGIENIC ASPECTS OF THE USE OF NEW PREPARATIONS FOR CONTROLLING SEEPAGE IN WATER BODIES, (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
R. V. Petrov, and V. I. Vorobets.
Gig Sanit 5, p 105-106, (1975).

Descriptors: *Seepage control, *Linings, *Canal linings, Public health, Rodents, *Industrial wastes, Oil wastes, Detergents, Acids, Alcohols, Water pollution.

Full-scale and experimental investigations showed that the distillation residues of the production of synthetic aliphatic acids and alcohols, which are wastes of petroleum refineries and detergent-producing factories, can be used in quantities up to 5 tons/ha for constructing waterproof facings on the beds of water bodies and irrigation canals. The preparations in this dose did not have toxic effects on rats in a 6-mo. experiment.--Copyright 1976, Biological Abstracts, Inc.
W77-02269

EFFECTS OF WATERHYACINTH COVER ON WATER CHEMISTRY, PHYTOPLANKTON, AND FISH IN PONDS,
Auburn Univ., Ala. Dept. of Fisheries and Allied Aquacultures.
For primary bibliographic entry see Field 5G.
W77-02291

PROJECT DEVELOPMENT AND DATA PROGRAMS FOR ASSESSING THE QUALITY OF THE WILLAMETTE RIVER, OREGON,
Geological Survey, Portland, Oreg. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-02301

SELECTION OF STREAMFLOW AND RESERVOIR-RELEASE MODELS FOR RIVER-QUALTIY ASSESSMENT,
Geological Survey, Jackson, Miss.; and Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 2A.
W77-02302

EFFECTS OF WATER-MANAGEMENT PRACTICES ON THE FLOW OF THE SOUTH PLATTE RIVER, COLORADO,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-02303

PREDICTED AND OBSERVED TEMPERATURE AND WATER-QUALITY CHANGES OF LAKES AND RESERVOIRS,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 2H.
W77-02304

SIMULATED EFFECTS OF THE PROPOSED TENNESSEE COLONY RESERVOIR ON GROUND-WATER CONDITIONS IN THE CARRIZO-WILCOX AQUIFER AND TRINITY RIVER ALLUVIUM, TEXAS,
Geological Survey, Austin, Tex. Water Resources Div.
S. Garza.
Reprint from International Symposium on the Hydrological Characteristics of River Basins and the Effects on these Characteristics of Better Water Management, held in Tokyo, Japan, December 1975: International Association of Hydrological Sciences Publication No. 117, p 597-605, 1975. 4 fig, 9 ref.

Descriptors: *Baseline studies, *Pre-impoundment, *Computer models, *Steady flow, Effects, Aquifers, Downstream, Reservoirs, Forecasting, Groundwater, Aquifer characteristics, *Texas.
Identifiers: *Trinity River flood plain(Tex), *Carrizo-Wilcox aquifer(Tex).

Digital-computer models were used to simulate the steady-state effects of the proposed Tennessee Colony Dam and Reservoir on ground-water conditions in the Carrizo-Wilcox aquifer and in the Trinity River alluvium downstream from the reservoir. The proposed structure, located south of Dallas on the Trinity River flood plain, is part of a multipurpose development by the U.S. Army Corps of Engineers on the Trinity River and tributaries between the Dallas-Fort Worth area and the Texas Gulf Coast. Preliminary analyses indicate that the potentiometric surface in the Carrizo-Wilcox aquifer in the outcrop area would be near land surface only in low-lying areas near the reservoir shoreline, where rises of 30 feet to more than 40 feet would occur in some areas. Lesser rises would occur in the area where the aquifer is artesian, but they would spread out over greater distances; rises of 5 feet would occur at distances of 20 miles from the dam. Rises in aquifer head in the Trinity River alluvium would extend to not more than 5 miles downstream from the proposed dam. Without remedial action, the altitude of the potentiometric surface would be above or near land surface in most of the area within about 2 miles downstream from the dam. (Woodard-USGS)
W77-02305

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 1. NORTH ATLANTIC SLOPE BASINS--VOLUME 3. BASINS FROM MARYLAND TO YORK RIVER.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-02307

DEPTH TO WATER TABLE, RECHARGE AREAS, DRAINAGE BASINS, AND RELIEF OF DUVAL COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-02311

TRANSVERSE MIXING IN NATURAL CHANNELS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-02313

EFFECTS OF WATER MANAGEMENT ON FRESH-WATER DISCHARGE TO BISCAYNE BAY,
Geological Survey, Tallahassee, Fla. Water Resources Div.
T. J. Buchanan, and H. Klein.
Paper presented at Biscayne Bay Symposium I, held in Florida, April 2-3, 1976, University of Miami Sea Grant Special Report No 5, p 271-277, 1976. 4 fig, 7 ref.

Descriptors: *Watershed management, *Flood control, *Flow control, *Water quality, *Surface-groundwater relationships, Florida, Canals, Saline water intrusion, Bays, Water level fluctuations, *Florida.
Identifiers: *Biscayne Bay(Fla).

Prior to development in southeast Florida, fresh water discharged to Biscayne Bay consisted of flow through natural drainageways, overland flow and coastal underseepage from the Biscayne aquifer. Present day discharge to the bay is seasonal, from controlled canals and seepage. The fresh-water flow to Biscayne Bay has been significantly reduced in quantity and in time due to extensive flood and water control measures instituted as a result of the extensive flooding in 1947. As a result of these flood and water control measures, surface flows could be fully controlled in the Everglades by the end of 1962. Because of the controls fresh-water levels in south Dade now recede twice as fast as before. Thus, since 1953 annual fresh-water flow to the bay has been reduced by about 20 percent and the time period for storm runoff has also been reduced. (Woodard-USGS)
W77-02314

HYDROLOGY OF LAKE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-02316

WATER RESOURCES INFORMATION NEEDS FOR THE SUWANNEE RIVER WATER MANAGEMENT DISTRICT,
Geological Survey, Tallahassee, Fla. Water Resources Div.
K. Vanlier, S. D. Leach, C. W. Leve, and J. C. Rosenau.
Suwannee River Water Management District, White Springs, Information Circular No 1, 1975. 65 p, 29 fig, 12 tab, 13 ref.

Descriptors: *Watershed management, *Water resources, *Water districts, *Florida, *Hydrologic data, Data collections, Planning, Network design, Water supply, Water demand, Water utilization, Water quality, Surface waters, Groundwater.
Identifiers: *Suwannee River basin(Fla), Data base applications.

The report summarizes the availability of hydrologic data, portrays future data needs and the networks and programs that will have to be implemented to obtain data not already available for the Suwannee River basin in Florida. The existing data base consists of extensive geologic and topographic mapping and water resource investigations in 7 of the 15 counties of the District. It also consists of large blocks of water-use data, streamflow and ground-water-level records and lake- and reservoir-stage records. Water-quality records are available for 17 sites. The location of all data-collection points is shown. Data collection techniques are included. (Woodard-USGS)
W77-02318

COMPARISON OF LINEAR SYSTEMS AND FINITE DIFFERENCE FLOW-ROUTING TECHNIQUES,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-02319

FLOW DATA COLLECTION FOR INFILTRATION-INFLOW ANALYSIS,
Whitman, Requardt and Associates, Baltimore, Md.
For primary bibliographic entry see Field 5D.
W77-02334

ECONOMIC AND ENVIRONMENTAL IMPACTS OF AGRICULTURAL LAND DRAINAGE IN ONTARIO,
York Univ., Downsview (Ontario). Dept. of Geography.
W. C. Found, A. R. Hill, and E. S. Spence.
Journal of Soil and Water Conservation, Vol. 31, No. 1, p. 20-24, 1976. 2 fig, 1 tab, 10 ref.

Descriptors: *Environmental effects, *Economic impact, *Drainage systems, *Canada, Ditches, Drainage programs, Agriculture, Agricultural engineering, Drainage effects, Cost-benefit ratio, Cost-benefit analysis, Economic justification.
Identifiers: *Ontario(Canada).

Economic and environmental impacts of government-assisted agricultural land drainage in seven Ontario townships, which are representative of the full range of drainage conditions in the province, were investigated. Thirty-seven drainage projects completed between 1965 and 1970 were included. Emphasis was on the local impacts as experienced at the level of the individual farm and municipal outlet drains, and benefit-cost ratios were derived for each project. It is concluded that on the whole, the drainage projects have generated benefits for agriculture at the local level without creating

undue environmental damage. However, a number of drainage projects had a very low benefit-cost ratio, and much variation existed even within a given township. This variation was accounted for by the identification of seven variables: (1) agricultural productivity of the environment, (2) installation of field tile drainage, (3) special hydrological conditions, (4) local initiative with respect to use of the drains, (5) type of drainage project, (6) quality of the drain engineering, and, (7) weather conditions since completion of the projects. The only serious environmental losses reported pretained to loss of permanent wetlands and the channelization of streams. However, the cumulative effect of a number of drainage projects, each of which has only minor effects on the environment, may have serious hydrological consequences. (Luedtke-Wisconsin)
W77-02425

THE FLOOD DISASTER PROTECTION ACT OF 1973,
Pennsylvania State Univ., University Park. Dept. of Business Law.
For primary bibliographic entry see Field 6F.
W77-02427

MINNESOTA WATER RESOURCES BOARD AND WATERSHED DISTRICTS.
Minnesota Water Resources Board, St. Paul.
For primary bibliographic entry see Field 6E.
W77-02428

MARYLAND HIGHWAY DRAINAGE STUDY: VOLUME I - SUMMARY REPORT,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W77-02490

SKYLAB IMAGERY: APPLICATION TO RESERVOIR MANAGEMENT IN NEW ENGLAND,
Cold Regions Research and Engineering Lab., Hanover, N.H. Research Div.
H. L. McKim, L. W. Gatto, C. J. Merry, and R. K. Haugen.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-17464, Price codes: A04 in paper copy, A01 in microfiche. Report NASA-CR-144514, September 1975. 59 p, 11 fig, 12 tab, 20 ref, 2 append. NASA T-4646B.

Descriptors: *Remote sensing, *Reservoir operation, *Land use, *Runoff, *New England, Satellites(Artificial), Aerial photography, Surveys, Photography, Reservoirs, Estuaries, Rivers, Classification, Land classification, Watersheds(Basins), Water resources, Water resources development.
Identifiers: *Skylab, *LANDSAT, Imagery.

The purpose of this investigation was to determine the utility of Skylab S190A and B photography for providing reservoir management information in New England. LANDSAT, Skylab S190A and S190B and RB-57/RC8 images were reduced to a common scale of 1:63,360 for a mapping base to demonstrate the extent to which the imagery could be utilized in the preparation of reconnaissance land use maps. These types of maps are required in the baseline evaluation of areas for reservoir management planning and for future environmental planning activities, i.e., permit evaluation and impact statements. Visual interpretations were accomplished on original NASA color infrared S190A/B and RB-57/RC8 transparencies and a LANDSAT false color print. The relative utility of the multiband imagery in identifying and quantifying hydrologic factors was evaluated. The land use statistics for two small watersheds were determined, and the effects of these land use factors were appraised for possible contribution to runoff potential. Significant findings of this investigation were as follows: (1) S190B imagery is superior to the LANDSAT MSS imagery for land use mapping and is as useful for category I and II land use mapping as the high altitude RC8 imagery; (2) for evaluating volume runoff potentials, the S190B imagery was found to be as useful as the RB-57/RC8 imagery; and (3) where regional hydrologic surveys and land use mapping are critical requirements in urban planning and natural resource development, the S190B imagery is of great potential value. (Sims-ISWS)
W77-02499

EVALUATION OF THE FEASIBILITY OF USING THE DATA COLLECTION SYSTEM TO OPERATE A NETWORK OF HYDROLOGICAL AND CLIMATO-LOGICAL STATIONS AT SITES REMOTE FROM NORMAL COMMUNICATION LINKS,
Department of Natural Resources, Quebec.
For primary bibliographic entry see Field 7B.
W77-02501

ELASTIC-PLASTIC STABILITY ANALYSIS OF MINE-WASTE EMBANKMENTS,
Bureau of Mines, Spokane, Wash. Spokane Mining Research Center.
For primary bibliographic entry see Field 8D.
W77-02502

RETRANSMISSION OF HYDROMETRIC DATA IN CANADA,
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.
For primary bibliographic entry see Field 7C.
W77-02506

USE OF RADAR INFORMATION IN DETERMINING FLASH FLOOD POTENTIAL,
National Weather Service, Garden City, N. Y. Eastern Region.
For primary bibliographic entry see Field 2B.
W77-02509

USE OF PLANT PATHOGENS FOR BIOREGULATION OF AQUATIC MACROPHYTES,
Florida Univ., Gainesville. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5G.
W77-02514

PRESSING CHARACTERISTICS OF WATER-HYACINTH,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2I.
W77-02527

EVALUATION OF CERCOSPORA RODMANII AS A BIOLOGICAL CONTROL OF WATER-HYACINTHS,
Florida Univ., Gainesville. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5G.
W77-02528

CERCOSPORA RODMANII, A NEW PATHOGEN OF WATER HYACINTH WITH BIOLOGICAL CONTROL POTENTIAL,
Florida Univ., Gainesville. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5G.
W77-02540

MYCOLEPTODISCUS TERRESTRIS LEAF SPOT ON WATERHYACINTH,
Florida Univ., Gainesville. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5G.
W77-02543

4B. Groundwater Management

ANALYSIS OF STORM WATER SEEPAGE BASINS IN PENINSULAR FLORIDA,
Florida Univ., Gainesville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-02083

GEOPHYSICAL STUDY OF THE WATERBEARING STRATA IN BITTERROOT VALLEY, MONTANA,
Montana Univ., Missoula. Dept of Geology.
For primary bibliographic entry see Field 2F.
W77-02085

THE ARIZONA WATER PLAN: A STATUS REPORT,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 4D.
W77-02104

SEEPAGE FROM TRAPEZOIDAL CANAL IN ANISOTROPIC SOIL,
Indian Inst. of Science, Bangalore. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W77-02137

INVESTIGATION OF TWO-REGIME WELL FLOW,
University Coll. of Swansea (Wales).
P. Huyakorn, and C. R. Dudgeon.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY9, Proceedings Paper 12383, p 1149-1165, September 1976. 6 fig, 35 ref, 3 append.

Descriptors: *Aquifers, *Base flow, *Water wells, Water yield, Finite element analysis, Mathematical models, Equations, Hydraulic gradient, Velocity, Hydraulic conductivity, Darcys law, Reynolds number, Numerical analysis, Hydraulic models, Particle size, Pump testing.
Identifiers: *Two-regime flow, Galerkin method.

A mathematical method and a Galerkin finite element formulation were presented for steady two-regime flow toward wells in confined and unconfined aquifers. The model was verified by comparing the finite element solutions of typical cases with pumping test results obtained from laboratory experiments. A new type curve method for determining the in-situ hydraulic characteristics of a selected aquifer material was described. It was shown that the method leads to good agreement between the theory and experiments and that the in-situ values may be quite different from the corresponding values obtained from permeability tests on a sample of the aquifer. (Visocky-ISWS)
W77-02142

NUMERICAL SOLUTION OF BOUSSINESQ EQUATION,
Punjab Agricultural University, Ludhiana (India). Dept. of Soil and Water Engineering.
For primary bibliographic entry see Field 2F.
W77-02143

PREDICTION OF MOUND GEOMETRY UNDER RECHARGE BASINS,
San Jose State Univ., Calif.
For primary bibliographic entry see Field 2F.
W77-02144

MINIMIZING COSTS IN WELL FIELD DESIGN IN RELATION TO AQUIFER MODELS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 8B.
W77-02161

THE DETERMINATION OF SEASONAL VARIATIONS IN GROUNDWATER RECHARGE BY DEUTERIUM AND OXYGEN-18 ANALYSIS FOR THE TUCSON BASIN, ARIZONA,
Arizona Univ., Tucson. Dept. of Geosciences.
For primary bibliographic entry see Field 2F.
W77-02169

TRANSIENT MOVEMENT OF WATER AND SOLUTES IN UNSATURATED SOIL SYSTEMS, PHASE II,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2G.
W77-02189

HYDROGEOLOGIC CHARACTERISTICS OF THE MISSOURI RIVER VALLEY FLOOD PLAIN,
Missouri Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W77-02194

WATER QUALITY IMPACTS OF URANIUM MINING AND MILLING ACTIVITIES IN THE GRANTS MINERAL BELT, NEW MEXICO,
Environmental Protection Agency, Dallas, Tex. Region VI.
For primary bibliographic entry see Field 5G.
W77-02208

PROCEEDINGS: 8TH ANNUAL WATER RESOURCES SEMINAR GROUNDWATER RESOURCES AND DEVELOPMENT NOVEMBER 24 AND 25, 1975.
Minnesota Univ., Minneapolis. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 491, Price codes: A04 in paper copy, A01 in microfiche. WRRC Bulletin 87, May 1976, 45 p. OWRT A-999-MINN(4D).

Descriptors: *Conference, *Groundwater, *Minnesota, Storm water, *Water pollution, Monitoring, Water quality, *Water management(Applied), *Groundwater resources, Regional analysis.

The proceedings of a conference on groundwater, include discussions of topics such as issues and trends in groundwater use, occurrence and quality of groundwater in Minnesota, monitoring of groundwater, stormwater as a potential contaminant, and regional approaches to groundwater management. (Walti-Minnesota)
W77-02223

DESCRIPTIONS AND CHEMICAL ANALYSES FOR SELECTED WELLS IN THE CENTRAL SACRAMENTO VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-02299

STATUS OF GROUND-WATER MODELING IN THE U.S. GEOLOGICAL SURVEY,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-02300

EFFECTS OF WATER-MANAGEMENT PRACTICES ON THE FLOW OF THE SOUTH PLATTE RIVER, COLORADO,
Geological Survey, Lakewood, Colo. Water Resources Div.
R. T. Hurr.
Reprint from International Symposium on the Hydrological Characteristics of River Basins and the Effects on these Characteristics of Better Water Management, held in Tokyo, Japan, December 1975: International Association of Hydrological Sciences Publication No. 117, p 611-618, 1976. 7 fig, 1 ref.

Descriptors: *Water management(Applied), *Surface-groundwater relationships, *Colorado, *Irrigation, Water yield, Water utilization, Water demand, Diversion, Streamflow, Water wells, Groundwater recharge, River basins, Flow control, Model studies.
Identifiers: *South Platte River(Colo).

Water-management practices have affected the various components which make up the flow of the South Platte River in Colorado. Installation of wells and ground-water withdrawals that for many years were individual and unregulated farm-management practices, have reduced the return flow to the river. However, an increase in trans-mountain diversions that resulted in an increased return flow of irrigation water to streams tributary to the South Platte River, occurred simultaneously with a decrease in direct diversions from the river. The effect was little net change in annual stream-flow of the South Platte River at the Colorado-Nebraska State line. Design of effective and efficient water-management practices is directly influenced by the interrelations between ground water and surface water, and the effects of imported water on the system. Currently a study of the South Platte River includes the calibration of a computer model of the study area based on observed hydraulic characteristics and interrelations. When calibrated the model can be used to determine future effects of alternative management plans. (Woodard-USGS)
W77-02303

SIMULATED EFFECTS OF THE PROPOSED TENNESSEE COLONY RESERVOIR ON GROUND-WATER CONDITIONS IN THE CARRIZO-WILCOX AQUIFER AND TRINITY RIVER ALLUVIUM, TEXAS,
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-02305

POTENTIAL FOR DEVELOPMENT OF GROUND WATER AT A TEST SITE NEAR TRURO, MASSACHUSETTS,
Geological Survey, Boston, Mass. Water Resources Div.
J. H. Guswa, and C. J. Londquist.
Open-file report 76-614, 1976. 22 p, 9 fig, 2 tab, 11 ref.

Descriptors: *Groundwater resources, *Groundwater availability, *Aquifer testing, *Saline water-freshwater interfaces, Sea water, *Massachusetts, Coasts, Water supply, Projection, Water resources development.
Identifiers: *Truro(Mass).

An aquifer test was carried out at a possible ground-water development site in Truro, Massachusetts. Average lateral hydraulic conductivity for material in the screened interval of the test well is 216 feet per day. Specific yield of the material at water-table depth is about 0.10. Anisotropy, or ratio of lateral hydraulic conductivity to vertical hydraulic conductivity, is between 1 and 5 for the uppermost 60 feet of saturated material, but is probably much higher at greater depths. Calculation of drawdown after pumping 200 days at 1 million gallons per day indicates lateral intrusion of saline water from the sea would not reach the well and that the area of ground-water contribution would be sufficient to intercept an amount of average annual recharge equal to pumpage. Using the previously determined aquifer constants and the maximum drawdown after 200 days of pumping at 1 million gallons per day, it was determined that a stable upconing adjustment of the fresh water/saline-water interface would occur below the pumping well, and saline water would not reach the well through vertical intrusion. (Woodard-USGS)
W77-02306

RECONNAISSANCE OF GROUND-WATER RESOURCES OF THE SQUAXIN ISLAND INDIAN RESERVATION, WASHINGTON,
Geological Survey, Tacoma, Wash. Water Resources Div.
W. E. Lum, II, and K. L. Walters.
Open-file report 76-382, 1976. 49 p, 10 fig, 3 tab, 11 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Water quality, *Available water, Pumping, Water yield, Water pollution sources, Septic tanks, Biological properties, Saline water intrusion, Chemical analysis, Water supply, *Indian reservations, *Washington.
Identifiers: *Squaxin Island Indian Reservation(Wash).

A supply of fresh ground water for the Squaxin Island Indian Reservation, Washington, exists in saturated deposits underlying the 3.09-square-mile island. Four test wells tapped a water-bearing zone of sand and gravel and had yields ranging from 27 to 170 gpm, with drawdowns of about 5 feet to about 65 feet. Except for high concentrations of iron and manganese (which can be treated and reduced for domestic use), the water quality is good. Conditions for drain-field waste disposal from septic tanks are good in at least the northern two-thirds of the island. The danger of inducing seawater encroachment can be minimized by maintaining pumping levels above sea level, using a network of several wells pumped intermittently into a storage facility, and spacing these wells to spread out the effects of pumping. In the northern half of the island, wells 100 to 200 feet deep may yield 25 to 100 gpm with minimum chances of seawater encroachment. The southern half of the island has a smaller apparent potential for groundwater development and an increased possibility of seawater encroachment. (Woodard-USGS)
W77-02308

DEPTH TO WATER TABLE, RECHARGE AREAS, DRAINAGE BASINS, AND RELIEF OF DUVAL COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-02311

MAPS SHOWING GROUND-WATER CONDITIONS IN THE LOWER BIG CHINO VALLEY AND WILLIAMSON VALLEY AREAS, YAVAPAI AND COCONINO COUNTIES, ARIZONA,
Geological Survey, Tucson, Ariz. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-02312

EFFECTS OF WATER MANAGEMENT ON FRESH-WATER DISCHARGE TO BISCAYNE BAY,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-02314

STRATIGRAPHY OF THE PALEOCENE AND LOWER PART OF THE EOCENE IN WESTERN TENNESSEE,
Geological Survey, Nashville, Tenn. Water Resources Div.
For primary bibliographic entry see Field 2F.

W77-02315

HYDROLOGY OF LAKE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
D. D. Knochenmus, and G. H. Hughes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 775, Price codes: A06 in paper copy, A01 in microfiche. Water-Resources Investigations 76-72, August 1976. 100 p, 35 fig, 15 tab, 55 ref.

Descriptors: *Hydrologic budget, *Surface waters, *Groundwater, *Water supply, *Water quality, Water demand, Aquifer characteristics, Groundwater movement, Water yield, Pumping, Groundwater recharge, Streamflow, Lakes, Hydrologic data, Water wells, Chemical analysis, Saline water-freshwater interfaces, *Florida.
Identifiers: *Lake County(Fla).

Lake County includes a 1,150 square-mile area consisting of ridges, uplands, and valleys in central-peninsular Florida. About 32 percent of the county is covered by lakes, swamps, and marshes. Water requirements in 1970 averaged about 54 million gallons per day. About 85 percent of the water was obtained from wells; about 15 percent from lakes. The Floridan aquifer supplies almost all the ground water used in Lake County. Annual recharge to the Floridan aquifer averages about 7 inches over the county; runoff average 8.5 inches. The quality of ground and surface water in Lake County is in general good enough for most uses; however, the poor quality of Floridan-aquifer water in the St. John River Valley probably results from the upward movement of saline water along a fault zone. Surface water in Lake County is usually less mineralized than ground water but is more turbid and colored. (Woodard-USGS)
W77-02316

A BIVARIATE-REGRESSION MODEL FOR ESTIMATING CHEMICAL COMPOSITION OF STREAMFLOW OR GROUNDWATER,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-02317

GROUND-WATER RESOURCES AND GEOLOGY OF ST. CROIX COUNTY, WISCONSIN,
Geological Survey, Madison, Wis. Water Resources Div.
R. G. Borman.
Wisconsin Geological and Natural History Survey, Madison, Information Circular No 32, July 1976. 30 p, 15 fig, 1 plate, 2 tab, 17 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water supply, *Water quality, *Hydrogeology, Water wells, Pumping, Water yield, Water users, Water demand, Available water, Chemical analysis, Hydrologic data, *Wisconsin.
Identifiers: *St. Croix County(Wis).

The increasing need for good-quality ground water in St. Croix, County, Wisconsin, caused by a steadily increasing population, can be met from the sand-and-gravel and sandstone aquifer. As much as 15 gpm can be obtained from wells almost everywhere in the county. Yields of more than 1,000 gpm are available from glacial deposits and alluvium where there is sufficient thickness of saturated sand and gravel. The sandstone aquifer underlies the entire county and is more than 1,000 feet thick in the southwest near River Falls. In St. Croix County the sandstone aquifer is all bedrock younger than Precambrian age and includes, in ascending order, from oldest to youngest, sandstones of Cambrian age (in ascending order, the Mount Simon, Eau Claire, Galesville, and Franconia Sandstones, and the Trempealeau Formation); and the Prairie du Chien Group, St. Peter Sandstone, and Galena-Platteville unit (Platteville and Decorah Formations and Galena Dolomite, undifferentiated), all of Ordovician age. This aquifer is capable of yielding more than 1,000 gpm to wells in much of the county and is the principal source of municipal water. The water from both aquifers is hard to very hard, having a median hardness between 180 and 190 mg/liter. Iron and manganese are locally present with combined total exceeding 0.3 mg/liter. Nitrate is a minor problem in both aquifers with median concentrations more than 10 mg/liter. About 3.83 mgd of ground water was pumped in the county in 1974, of which 94 percent was from the sandstone aquifer. About 44 percent of the total water pumped was for industrial and commercial use, 42 percent for residential use, and 14 percent for irrigation, institutional, and municipal use. (Woodard-USGS)
W77-02321

PRELIMINARY SELECTION OF STORM-WATER BASINS SUITABLE FOR INFILTRATION OF RECLAIMED WATER IN NASSAU COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Albany, N.Y. Water Resources Div.
For primary bibliographic entry see Field 5G.
W77-02322

GROUND-WATER HYDROLOGY OF THE COCOA WELL-FIELD AREA, ORANGE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
C. H. Tibbals, and J. M. Frazee, Jr.
Open-file report FL 75-676, January 1976. 67 p, 25 fig, 6 tab, 10 ref.

Descriptors: *Groundwater, *Hydrogeology, *Water wells, *Well data, *Water quality, Water supply, Data collections, Aquifer characteristics, Water levels, Pumping, Saline water-freshwater interfaces, Groundwater recharge, Chemical analysis.
Identifiers: *Orange County(Fla), Cocoa well-field area.

The city of Cocoa, Brevard County, Florida, supplies water for much of central Brevard County including Cape Kennedy and Patrick Air Force Base. The water supply is obtained from a well field in east Orange County. Many of the easternmost wells in that well field yield salty water (chloride concentration greater than 250 milligrams per liter). The interface between the fresh and salty water in the west part of the well field occurs at a depth of about 1,400 feet. An upward hydraulic gradient exists between the the lower (salty) zones and the upper, or pumped zones of the Floridan aquifer in the west part of the well field. Secondary artesian aquifers in the well-field area are relatively high-yielding but are of limited areal extent. However, they are suitable as a source of water for supplemental supply or for artificially recharging the Floridan aquifer. Fresh water was transferred by siphon from a secondary artesian aquifer to the Floridan aquifer at 90 gallons per minute. Artificial recharge and recovery experiments show that it is feasible to retrieve fresh water stored in salty zones of the Floridan aquifer. (Woodard-USGS)
W77-02323

ORGANIC POLLUTANTS CONTRIBUTED TO GROUNDWATER BY A LANDFILL,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 5B.
W77-02407

ASSESSING SYNTHETIC AND ADMIXED MATERIALS FOR LINING LANDFILLS,
Matrecon, Inc., Oakland, Calif.
For primary bibliographic entry see Field 5E.
W77-02410

GROUNDWATER AND GROUNDWATER LAW IN MASSACHUSETTS.
Massachusetts Commonwealth Div. of Water Resources, Boston.
Publication No. 8852-95-250, April 1976. 97 p. 21 fig., 9 tab., 57 ref.

Descriptors: *Groundwater resources, *Water pollution, *Water law, *Massachusetts, Groundwater availability, Streamflow, Groundwater recharge, Inter-basin transfers, Surface-groundwater relationships, Water levels, Water table, Water quality, Saline water intrusion, Waste disposal, Coliforms, Septic tanks, Eutrophication, Waste water disposal, Leachates, Deicers, Landfills, Land use, Metals, Common law, Well permits, Regulation, Water rights, Pesticides, Phenols, Judicial decisions, Water allocation(Policy), Sodium chloride.
Identifiers: *Groundwater law, Case studies.

The interrelationship of groundwater and surface water, together with the effects of man's activities on water quality, in Massachusetts, are described followed by case studies on water quantity and quality problems experienced in specific communities. Water quantity examples include: intercommunity competition for water resources, low streamflow related to groundwater withdrawal, need to protect recharge areas, and effect of out-of-basin transfers. Water quality cases include contamination by sodium chloride, by effluent from septic tanks, by leachate from solid waste disposal sites, and by other pollutants such as iron, lead, and pesticides. Current groundwater law in Massachusetts and the economic aspects of groundwater management are also discussed. It is concluded that: (1) consumptive use of groundwater may significantly degrade uses and rights in related surface water systems, (2) unregulated consumption use by private users could threaten to aggravate problems of safe yield, (3) existing common law groundwater rights in Massachusetts can be improved in light of modern knowledge and technology, (4) groundwater pollution is a recurring problem with regional as well as local impacts, resulting from road salt usage, concentrations of septic systems, and municipal and industrial waste disposal practices, and (5) land use practices can significantly impair recharge areas. (Luedtke-Wisconsin)
W77-02437

MARYLAND HIGHWAY DRAINAGE STUDY: VOLUME VI - AN EXPERIMENTAL EXAMINATION OF THE SUBSURFACE DRAINAGE OF ROADWAYS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W77-02493

TRANSPORT OF MASS AND ENERGY IN POROUS MEDIA DUE TO NATURAL CONVECTION--THE GEOTHERMAL BASIN PROBLEM,
Colorado Univ., Boulder. Dept. of Mechanical Engineering.
D. R. Kassoy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-247 087, Price codes: A02 in paper copy, A01 in microfiche. Report NSF-RA-N-75-118, March 26, 1975. 21 p, 1 fig, 20 ref. NSF AER74-03429.

Descriptors: *Geothermal studies, *Mass transfer, *Heat transfer, *Porous media, Energy, *Energy transfer, Thermal water, Aquifers, Groundwater, Geology, Model studies, Mathematical models, On-site investigations, Heat flow, Convection, Temperature, Geophysics.
Identifiers: *Geothermal fields, Nonisothermal fluids.

The initial 7-month study of physical phenomena occurring in geothermal basins was described. Geological and geophysical field data have been

utilized to develop plausible models of the energy-mass transport systems in geothermal anomalies. The basic describing equations for saturated thermally-active elastic porous media were discussed in the context of modeling physical processes occurring in the geothermal environment. From studies to date the following conclusions have been reached: (1) Deformations in the solid matrix resulting from the application of large liquid pressure gradients may be significant; (2) Two-temperature models will not be necessary for the convective modeling effort due to the very slow flow rates (1 cm/day) involved; (3) Vertical natural convection processes play a significant role in the transport of hot water and energy in undeveloped geothermal regions. Measured output prior to production is very closely estimated by vertical convection study predictions; (4) Locally permeable vertical fault zones may be the significant conduits for heated fluids from depth. Reservoir charging may result when the faulted region intersects relatively permeable horizontal formations; and (5) One of the most critical aspects of making computations and theoretical calculations is to establish models whose geological and mechanical characteristics relate closely to those found in nature. (Sims-ISWS)
W77-02507

A BIOECONOMIC SIMULATION ANALYSIS OF REGULATING GROUNDWATER IRRIGATION,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W77-02549

4C. Effects On Water Of Man's Non-Water Activities

ANALYSIS OF STORM WATER SEEPAGE BASINS IN PENINSULAR FLORIDA,
Florida Univ., Gainesville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-02083

WATERSHED MANAGEMENT'S EFFECTS ON MANY RESOURCES,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 3B.
W77-02109

WOODS CANYON--A LARGE SCALE WATERSHED MANAGEMENT EXPERIMENT: AN EXPLANATION AND INTERIM REPORT,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W77-02110

CHAPARRAL MANAGEMENT: ITS POTENTIAL--ITS PROBLEMS--ITS FUTURE,
Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W77-02111

AN EVALUATION OF WATER QUALITY INFORMATION: A CASE STUDY OF STREAMS IN METROPOLITAN NEW JERSEY,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Geography.
For primary bibliographic entry see Field 5A.
W77-02448

INADVERTENT WEATHER MODIFICATION,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 3B.
W77-02453

MARYLAND HIGHWAY DRAINAGE STUDY: VOLUME I - SUMMARY REPORT,
Maryland Univ., College Park. Dept. of Civil Engineering.
R. M. Ragan, and Y. M. Sternberg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 555, Price codes: A06 in paper copy, A01 in microfiche. Report AWO 74-073-046-1, July 1974. 117 p, 33 fig, 2 tab, 16 ref. DOT AWO74-073-046.

Descriptors: *Drainage, *Highways, *Runoff, *Maryland, Drainage practices, Drainage systems, Surface waters, Surface runoff, Subsurface drainage, Urban drainage, Storm drains, Drainage water, Hydrographs, Design storm, Floods, Hydrology, Hydraulics, Drainage engineering, Civil engineering.
Identifiers: *Highway drainage.

The report summarized the major areas covered in the seven detailed volumes comprising the final report of the Maryland Highway Drainage Study. Topics covered include an assessment of current highway drainage practice, a discussion of a design storm technique, and an analysis of surface and subsurface drainage practice. (See also W77-02491 thru W77-02493) (Sims-ISWS)
W77-02490

MARYLAND HIGHWAY DRAINAGE STUDY: VOLUME II - A COMPARISON OF MARYLAND HIGHWAY DRAINAGE PRACTICES WITH THOSE OF OTHER AGENCIES,
Maryland Univ., College Park. Dept. of Civil Engineering.
R. M. Ragan, and Y. M. Sternberg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 556, Price codes: A06 in paper copy, A01 in microfiche. Report AWO74-073-046-2, July 1974. 100 p, 38 fig, 1 tab, 1 append. AWO74-073-046.

Descriptors: *Drainage practices, *Highways, *Maryland, *Runoff, *Drainage, Drainage systems, Subsurface drainage, Surface runoff, Surface waters, Design storm, Storm drains, Urban drainage, Drainage water, Hydrographs, Drainage engineering, Hydrology, Hydraulics, Civil engineering.
Identifiers: *Highway drainage.

One of the key objectives of the Highway Drainage Study was a review of Maryland State Highway Administration drainage practice and a comparison with the approaches followed by other states. In developing this comparison of Maryland State Highway Administration drainage practices with those of other agencies, the Highway Departments of the States of Massachusetts, Connecticut, New York, New Jersey, Delaware, Pennsylvania, Ohio, Virginia, West Virginia, North Carolina, South Carolina, Tennessee, Kentucky, and California were contacted. The report included discussions of some of the key information contained in the drainage manuals of these other states and comparisons with the material included in Interim Hydraulic Criteria for the Design of Highways used by Maryland. Emphasis was placed on the methods used to determine peak discharges because this area shows the greatest variability among the states. (See also W77-02490) (Sims-ISWS)
W77-02491

MARYLAND HIGHWAY DRAINAGE STUDY: VOLUME III - A LINKED SYSTEM MODEL FOR THE SYNTHESIS OF HYDROGRAPHS IN URBAN AREAS,
Maryland Univ., College Park. Dept. of Civil Engineering.
M. J. Root, and R. M. Ragan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 557, Price Codes: A05 in paper copy, A01 in microfiche. Report AW074-073-046-3, July 1974. 84 p, 15 fig, 22 ref, 5 append. DOT AW074-073-046.

Descriptors: *Urban hydrology, *Model studies, *Drainage, Urban drainage, Mathematical models, Computer models, Algorithms, Hydrographs, Rainfall, Runoff, Urban runoff, Computer programs, Drainage practices, Drainage engineering, Design storm, Hydrology, Civil engineering.

The algorithm developed in this report made use of the equations for one-dimensional, unsteady, spatially varied open channel flow and an empirical overland flow mathematical model. The technician or engineer does not need a knowledge of the equations used since he is required only to describe the physical features of the drainage area and to select the hyetograph. The computer automatically develops the hydrograph and returns the value of the discharge at pre-selected time intervals. (See also W77-02490) (Sims-ISWS)
W77-02492

MARYLAND HIGHWAY DRAINAGE STUDY: VOLUME VI - AN EXPERIMENTAL EXAMINATION OF THE SUBSURFACE DRAINAGE OF ROADWAYS,
Maryland Univ., College Park. Dept. of Civil Engineering.
R. S. Taylor, and R. M. Ragan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 558, Price Codes: A05 in paper copy, A01 in microfiche. Report AW074-073-046-6, July 1974. 94 p, 28 fig, 28 tab, 23 ref, 5 append. DOT AW074-073-046.

Descriptors: *Subsurface drainage, *Model studies, *Highways, *Drainage, Drainage systems, Infiltration, Roads, Reviews, Drainage engineering, Groundwater, Storm drains, Drainage waters, Hydrographs, Hydrology, Drainage engineering, Civil engineering.
Identifiers: *Highway drainage, Analog models, Hele-Shaw model.

The report described a series of experiments conducted with an electric analog and Hele-Shaw Model to investigate the steady and unsteady flows in highway base courses. The Hele-Shaw Model was used to study the effects of the general groundwater table and local geometry of the system on the unsteady discharge into a typical ditch section. The geometry used was a fixed trench section without a pipe that modeled the field condition of a drainage ditch backfilled with coarse gravel. Before the experiments were started, a dimensional analysis was performed to isolate the important parameters influencing the discharge. The dimensional analysis was used to control the groundwater elevations set in the ditch and at the upper boundary and the distance from the trench bottom to the impervious layer. A hydrograph was obtained for each set of geometric conditions. The analog model was used to study the pipe-trench, sub-base system with a spatially varied infiltration entering the sub-base through the pavement and shoulder. The diameter of the drain was allowed to vary from four to twelve inches (300%) while the depth of the embedment varied. (See also W77-02490) (Sims-ISWS)
W77-02493

REMOTE SENSING OF EFFECTS OF LAND-USE PRACTICES ON WATER QUALITY,
Kentucky Univ., Lexington. Dept. of Forestry.
For primary bibliographic entry see Field 5A.
W77-02497

SKYLAB IMAGERY: APPLICATION TO RESERVOIR MANAGEMENT IN NEW ENGLAND,
Cold Regions Research and Engineering Lab., Hanover, N.H. Research Div.
For primary bibliographic entry see Field 4A.
W77-02499

SOME EFFECTS OF THE ASWAN HIGH DAM ON WATER AND FISHES OF LAKE BORULLUS, A. R. E.,
Academy of Scientific Research and Technology, Cairo (Egypt).
For primary bibliographic entry see Field 5C.
W77-02512

4D. Watershed Protection

THE ARIZONA WATER PLAN: A STATUS REPORT,
Arizona Water Commission, Phoenix.
T. C. Clark.
In: 19th Annual Arizona Watershed Symposium Proceedings, Report No. 7, p 9-23, Sept. 1975. 2 fig, 7 tab.

Descriptors: *Planning, *Water resources development, *Arizona, *Water supply, *Water utilization, Consumptive use, Groundwater, Groundwater availability, Groundwater recharge, Surface waters, Basins, *Water requirements, *Water demand, *Watershed management, Water yield improvement.

Information is presented from the Arizona Water Commission's report, Inventory of Resources and Uses, which represents Phase I of the Arizona Water Plan. This report compares water supply and use and discusses Arizona's current water problems. Phases II and III will provide technical evaluation of the various forms the water plan might take. The state's total annual surface water diversion from 1968 to 1972 was 3.3 million acre-feet, with Yuma and Maricopa counties accounting for 57 and 29% of the total, respectively. Water resources development is concentrated in 24 basins which contain 89% of the state's population, produce some 60% of the mineral industry revenues and 96% of the crops, and account for 94% of the total water depletion. Substantial groundwater remains in storage, but the annual rate of recharge is limited. Of the water supply, 60% is withdrawn from the ground and 40% from surface supplies. The estimated total dependable supply is 2.8 million acre-feet, of which only 11% is comprised of annual recharge or dependable groundwater supply. Agriculture consumes 89% of the water used. Problems such as the imbalance between supply and consumption are discussed. (See W77-02105 thru W77-02111) (Jahns-Arizona)
W77-02104

ARIZONA'S FROZEN ASSETS: SNOWPACK MANAGEMENT,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 2C.
W77-02106

MANAGING THE SOUTHWESTERN NATIONAL FORESTS FOR WATER AND RELATED RESOURCES,
Forest Service (USDA), Washington, D. C.
For primary bibliographic entry see Field 4A.
W77-02107

ARIZONA'S FROZEN ASSETS: VOLUMETRIC FORECASTS FROM SNOWPACK,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 2C.
W77-02108

WATERSHED MANAGEMENT'S EFFECTS ON MANY RESOURCES,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 3B.
W77-02109

WOODS CANYON--A LARGE SCALE WATERSHED MANAGEMENT EXPERIMENT: AN EXPLANATION AND INTERIM REPORT,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W77-02110

CHAPARRAL MANAGEMENT: ITS POTENTIAL--ITS PROBLEMS--ITS FUTURE,
Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W77-02111

OPERATION OF A RESERVOIR COLLECTING WATER FROM A SMALL WATERSHED,
Technion - Israel Inst. of Tech., Haifa. Lowdermilk Faculty of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W77-02126

CONTROLLING EROSION AND SEDIMENTATION AT CONSTRUCTION SITES,
G. Dallaire.
Civil Engineering, American Society of Civil Engineers, p 73-77, October 1976. 5 fig, 12 photo.

Descriptors: *Erosion control, *North Carolina, *Erosion, *Sedimentation, *Control, Control systems, Runoff, Sediments, Sediment transport, Water pollution control, Water supply, Projects.
Identifiers: *Control equipment, *Construction practices, *Construction sites, Sediment-laden runoff, Stream turbidity.

In recent years the Environmental Protection Agency (EPA) and a number of states have placed emphasis on controlling erosion and sediment-laden runoff from construction sites. Sediment from construction sites causes stream turbidity, impaired water quality, spoiled water supplies, unsightly deposits on adjacent property, and harm to aquatic life. North Carolina has one of the most progressive programs for controlling construction site erosion and sedimentation. This article described some of the methods used in North Carolina and by the EPA. Developers were urged to: (1) divert runoff water originating upstream from the construction site so that water would not flow over bare-earth areas and erode soil; (2) limit the area being graded on a site at any one time to prevent vast stretches of bare soil; (3) limit the time any given area was laid bare; and (4) trap sediment-laden runoff in temporary or permanent basins, or filter the runoff by using silt fences, wood-chip barriers, or brush barriers. (Roberts-ISWS)
W77-02146

FLOW RECESSION IN THE EPHEMERAL STREAM,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2E.
W77-02162

INFLUENCE OF TALL WHEATGRASS WIND BARRIERS ON SOIL DRYING,
Agricultural Research Service, Sidney, Mont.
J. K. Aase, and F. H. Siddoway.
Agronomy Journal, Vol. 68, No. 4, p 627-631, July-August 1976. 10 fig, 24 ref.

Descriptors: *Windbreaks, *Wind erosion, *Soil erosion, *Soil water, *Montana, *Wheatgrasses, Evaporation, Soil stabilization, Crop response, Drying.

Studies were conducted to determine the effect of a tall wheatgrass (Agropyron elongatum) wind barrier system on soil drying from fallow soil compared with open-field fallow. A Williams loam soil near Sidney, Montana was used for the experiment. After a 3.8 cm irrigation was applied, soil water content was sampled at half-hour intervals and small depth increments to 10 cm. The top 4 cm of soil inside the barrier system stayed wetter for about 3 days after irrigation when compared with the unprotected area. Drying rates remained constant until about noon of the day after irrigation, at which time the rate was influenced by exposure to wind. Barriers could help during periods of small intermittent precipitation events in April and May by creating a suitable soil water environment for seed germination, plant emergence and establishment, and soil resistance to wind erosion. Barriers control wind erosion except when strong winds blow parallel or nearly parallel to them. If a wind shifts to parallel after intense thunderstorm activity, the wetter surface from barrier protection extends soil resistance to wind erosion. (Jahns-Arizona)
W77-02168

SALT MARSH ESTABLISHMENT AND DEVELOPMENT,
Environmental Concern, Inc., St. Michaels, Md.
E. W. Garbisch, P. B. Woller, and R. J. McCallum.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-014 136, Price codes: A06 in paper copy, A01 in microfiche. Coastal Engineering Research Center TM-52, June 1975. 110 p. 46 fig., 2 tab., 16 ref., 4 append. G31265. DACW72-73-C-0009.

Descriptors: *Vegetation establishment, *Shore protection, *Erosion control, *Coastal marshes, Salt marshes, Invertebrates, Benthos, Chesapeake Bay, Biological communities, Tidal effects, Intertidal areas, Plant growth.
Identifiers: *Spartina alterniflora, Dredged material, Spartina patens, Spartina cynosuroides, Distichlis spicata, Ammopila breviligulata.

In order to evaluate coastal shoreline erosion control by vegetation, the establishment of 10 to 15 week-old seedlings of Spartina alterniflora throughout the tidal zone, and of S. patens, S. cynosuroides, Distichlis spicata and Ammophila breviligulata throughout the supra tidal zones of natural and manmade shores exposed to different seasonal wave regimes in the central Chesapeake Bay region was investigated. In areas subject to extensive wave and suspended coarse sediment stresses S. alterniflora transplant mortalities were high, increasing with decreased elevation within the intertidal zone, and with increasing exposure at a given intertidal level within a groin system. Periodic fertilization, and delaying the planting time by one month, reduced mortalities. Mortalities from other causes were negligible. Survival of all species established above these zones was independent of exposure, and development was comparable. Consolidated dredged material substrate stimulated higher S. alterniflora vegetative spread than at either the fertilized or unfertilized unconsolidated sandy substrates. Periodic profile leveling of shoreline areas indicated fluctuations in substrate surface; the surface of the dredged substrate decreased 3 to 7 centimeters. Monitoring of macrobenthic invertebrate colonization revealed that after one year the dredged material site had the highest total population and the natural sites, the lowest. (Luedtke-Wisconsin)
W77-02420

MINNESOTA WATER RESOURCES BOARD AND WATERSHED DISTRICTS.
Minnesota Water Resources Board, St. Paul.
For primary bibliographic entry see Field 6E.

W77-02428

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

A BIOASSAY TO ASSESS WASTEWATER TOXICITY TO AEROBIC BIOLOGICAL TREATMENT,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-02081

THE USE OF A SPECIFIC ION ELECTRODE FOR DETERMINATION OF BROMIDE IN SOILS,
Texas Engineering Experiment Station, College Station.
For primary bibliographic entry see Field 2G.
W77-02100

DIFFUSION CELL FOR ISOLATION OF HYDROGEN FLUORIDE FROM THE ANALYZED SAMPLE DETERMINING FLUORINE IN WATER, (IN RUSSIAN),
Main Geophysical Observatory, Leningrad (USSR).
N. Sh. Vol'Berg, and T. A. Kuz'Mina.
Gig Sanit 6, p 51-52, 1975.

Descriptors: *Fluorine, Pollutant identification, isolation, *Fluorides, Sampling, Analytical techniques, Air pollution.
Identifiers: Analyzed, Cell, Design, Determining, Diffusion, Fluoride, Fluorine, Hydrogen, Isolation, New, Sample, Waste, Water, *Hydrogen fluoride.

A diffusion cell was designed for serial determinations of the content of F- in solid fluorides when analyzing air. To trap HF being liberated from the specimen, a cell cover made of a porous glass plate impregnated with KOH was used. The cell diffusion process consists of displacement of the volatile substance from its compound (for insoluble compounds), diffusion in a liquid layer, diffusion in a gas layer and diffusion in the pores of the sorbent. The cell design and the method of analysis provide high accuracy for measuring F- in solutions and can be used fr waste - and natural water determinations.
W77-02105

DETERMINATION OF SMALL QUANTITIES OF VINYL ACETATE IN AIR, WATER, ALCOHOLIC SOLUTIONS AND FOOD PRODUCTS, (IN RUSSIAN),
Science-Industry Association 'Plastoplimer', Leningrad (USSR).
L. I. Petrova, and Z. K. Boikova.
Gig Sanit 6, p 48-49, 1975.

Descriptors: *Pollutant identification, Foods, Air pollution, *Monitoring, Methodology, Plastics, *Analytical techniques, Sampling, *Colorimetry.
Identifiers: *Vinyl acetate.

In connection with the need to monitor the content of vinyl acetate in various media contacting plastics containing it, a method was developed permitting a sufficiently accurate determination of this substance not only in air but also in water, alcoholic solutions and food products. The method is based on the mericurization of vinyl acetate with the formation of complex compounds and subsequent colorimetric determination of the excess of mercuric acetate on the basis of the reaction with diphenylcarbazide. The sensitivity of the method is 0.001 mg in the analyzed sample.
W77-02117

EVALUATION OF THE RING OVEN TECHNIQUE FOR WATER MONITORING,
Atlantic Research Corp., Alexandria, Va.
R. E. Snyder, M. E. Tonkin, and A. M. McKissick.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-017 062, Price codes: A10 in paper copy, A01 in microfiche. Final Report September 1975. 209 p, 53 fig, 75 tab, 3 append. DADA17-73-C-3112.

Descriptors: *Pollutant identification, *Testing procedures, *Analytical techniques, *Monitoring, Evaluation, Water quality, Water pollution, Measurement, Testing, On-site tests, Water analysis, Chemical analysis, Iron, Lead, Magnesium, Zinc, Nitrates, Chlorides, Fluorides, Sulfates, Copper, Separation techniques.
Identifiers: *Ring oven technique, *Water test kit, Spot tests, Colorimetric tests, Field test kit, Thomas oven model E-10, Ring oven procedures, Iron content, Lead content, Nitrate content, Sulfate content.

The feasibility of using spot tests coupled with ring oven separation for the monitoring of selected species in natural water sources was demonstrated. The species investigated and their concentration ranges were: iron (0.1-10 ppm), lead (.05-1.0 ppm), magnesium (10-5000 ppm), zinc (1-20 ppm), chlorides (10-20,000 ppm), fluorides (0.1-10.0 ppm), nitrates (1.0-20 ppm), sulfates (10-3000 ppm), copper (0.1-5 ppm), calcium (20-10,000 ppm), cadmium (0.01-0.1 ppm), chromium (0.01-1 ppm), cyanide (0.1-5 ppm), manganese (0.02-2 ppm), and phosphate (0.02-2 ppm). (See also W77-02149) (Henley-ISWS)
W77-02148

EVALUATION OF THE RING OVEN TECHNIQUE FOR WATER MONITORING, APPENDICES,
Atlantic Research Corp., Alexandria, Va.
R. E. Snyder, M. E. Tonkin, and A. M. McKissick.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-017 063, Price codes: A06 in paper copy, A01 in microfiche. Final Report, 1975. 106 p. DADA17-73-C-3112.

Descriptors: *Pollutant identification, *Testing procedures, *Analytical techniques, *Laboratory tests, *Water quality, Water pollution, Measurement, Chemical reactions, Testing, Chemical analysis, Methodology, Water analysis, Separation techniques, Iron, Lead, Magnesium, Zinc, Nitrates, Chlorides, Fluorides, Sulfates, Copper, *Bibliographies.
Identifiers: Ring oven techniques.

Appendix A contained the results of the trial detection reagent evaluations for the 15 ions examined during this program. Reaction mechanisms and product structures were included if known. Appendix B described the separation schemes developed during this program for analysis of natural waters. Appendix C, Bibliography, contained 192 entries. (See also W77-02148) (Humphreys-ISWS)
W77-02149

AQUEOUS HALOGEN EQUILIBRIA, CASE I. HALOGEN IN PURE WATER,
Army Medical Bioengineering Research and Development Lab., Fort Detrick, Md.
For primary bibliographic entry see Field 5D.
W77-02150

PROGRAM REPORT-FY 1975, ATMOSPHERIC AND GEOPHYSICAL SCIENCES DIVISION, PHYSICS DEPARTMENT.
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 2B.
W77-02157

FECAL COLIFORM ANALYSIS: EFFECTS OF ELEVATED TEMPERATURES ON QUANTITATIVE RECOVERY,
Missouri Univ., Rolla. Dept. of Life Science.
J. B. Hufham.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 361, Price codes: A02 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, Rolla, Completion Report, October 12, 1976. 11 p, 4 fig, 5 ref. OWRT A-089-MO(1), 14-34-0001-6026.

Descriptors: *E. coli, Water quality, Temperature, Water pollution, *Coliforms, *Cultures, *Isolation, *Pollutant identification, Analytical techniques.

The theoretical concept of cell and culture death resulting from increased temperature is important to an understanding of the inaccuracy of the fecal coliform test procedure. Results of study on the differential effects of temperature on various types of membrane filters show that the type of filter is an important variable. Recoveries of known densities of pure cultures of E. coli varied from 10-70 percent from this variable alone. The importance of selection of the proper temperature for membrane evaluation cannot be stressed too strongly. Results show that the interaction of the membrane with the cell, resulting in loss of cell viability, is temperature dependent and varies from brand to brand. A modified fecal coliform procedure has been developed and field tested. This new procedure lessens the detrimental effects of the temperature on recovery of the organism.
W77-02182

WATER-BORNE VIRUSES: THEIR CHARACTERIZATION BY RAMAN SPECTROSCOPY,
Connecticut Univ., Storrs. Inst. of Water Resources.
C. N. Burke, W. H. Nelson, and T. Girshick.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 354, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, 1976. 6 p, 2 fig, 1 ref. OWRT A-055-CONN(1), 14-31-0001-4007.

Descriptors: *Viruses, *Centrifugation, *Public health, Water quality, *Spectroscopy, *Pollutant identification.
Identifiers: *Water-borne viruses, *Raman spectroscopy, *Density gradient centrifugation, Concentration methods, *Laser techniques, Temperature effects.

The research was designed to test raman spectrographic methods for sensitivity and specificity in identifying selected water-borne viruses, concentrating on those known to be pathogenic for man. Virus stocks of both DNA and RNA nucleic acid types, including Polio I, Sinbis, Vaccina and Vesicular stomatitis, were prepared and concentrated by density gradient centrifugation, using both sucrose and cesium chloride. Titrations of the viruses at several points were done using both plaque forming units and cytopathic effects in determining endpoints. Due to problems with instrumentation and especially virus concentration methods, raman spectrographic scans for prototype viruses did not result in clear-cut reproducible spectra. The differential centrifugation methods used did not provide a concomitant increase in titratable numbers of virus with reduction in total suspension volume. Although titration end-point determinations suggested levels as high as 10 to the 10th power to 10 to the 12th power had been achieved, spectra did not conform to theoretical numbers of viruses. The effects of using various laser sources and of temperature associated degradation, which may account for the theoretically high numbers of virus needed for satisfactory laser readings, may have also contributed to the unsatisfactory results. Other concentration methods are being considered. (de Lara-Connecticut)
W77-02183

LASER METHODS OF RAPID DETECTION, IDENTIFICATION AND QUANTITATION OF HUMAN ENTERIC VIRUSES IN SEWAGE AND RIVERS,
Rhode Island Univ., Kingston. Dept. of Chemistry.
W. H. Nelson, and P. W. Chang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 358, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, September 1, 1976. 32 p, 16 fig, 4 tab, 10 ref. OWRT A-058-RI(1). 14-34-0001-6041.

Descriptors: Spectroscopy, *Viruses, *Pollutant identification, Enteric bacteria, Sewage, Instrumentation, Analytical techniques.
Identifiers: *Laser methods, *Raman spectroscopy, *Poliovirus, *Enteric viruses.

This study has shown that it is possible to obtain Raman spectra of poliovirus in water solution. Since a Raman spectrum can be obtained in minutes or even seconds, in principle, it has been demonstrated that very rapid analysis of viruses is possible. Details of virus preparation, purification, and concentration have been discussed. Polio I spectra are similar to those of plant viruses studied previously, but are sufficiently different to allow spectra to be used for identification purposes. Problems of instrument sensitivity and rapid sample preparation have to be overcome before a virus analysis machine based upon Raman spectroscopy can be used routinely.
W77-02184

OPTICAL REMOTE SENSING OF WATER POLLUTANTS,
Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
J. J. Gallagher, and J. B. McManus.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 346, Price codes: A03 in paper copy, A01 in microfiche. Georgia Environmental Resources Center, Atlanta, Report ERC 0876, August 1976, 23 p., 3 fig, 3 tab, 11 ref. OWRT A-046-GA(1). 14-31-0001-4010.

Descriptors: Pollutants, *Fluorescence, *Remote sensing, Instrumentation, *Pollutant identification, *Analytical techniques, Monitoring, Pulp wastes, Measurement.
Identifiers: *Raman effect, Optical scattering, Argon laser, Pulp mill effluence.

Calculations have been performed to compare three optical scattering processes for remote sensing of water pollutants. The relative merits of the Raman effect, the resonance Raman effect and fluorescence are discussed. The greater intensity of the fluorescence signal must be considered in comparing these techniques for remote sensing. Other factors such as quenching, absorption and multiple scattering must, in turn, be studied. Instrumentation of laser sources applicable to water pollutants monitored has been investigated to identify sources currently available for light scattering experiments. Preliminary measurements of Raman scattering using a single monochromator, an argon ion laser as the excitation source and photon counting techniques have been performed.
W77-02192

REVISED DEPARTMENT OF THE ARMY PESTICIDE MONITORING PROGRAM, I APRIL, 1975,
Army Environmental Hygiene Agency, Aberdeen Proving Ground, Md.
C. C. Roan.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-004 030, Price codes: A03 in paper copy, A01 in microfiche. Entomological Special Study No. 44-004-74175, 1975. 30 p, 1 tab, 5 append.

Descriptors: *Pesticides, *Monitoring, *Sampling, Sediments, Soils, Birds, Fish, Environment, Public Health, *Analytical techniques, *Pesticide residues, Insecticides, Carbamate pesticides, Halogenated pesticides, Organophosphorous pesticides, Metals, Polychlorinated biphenyls, *Pollutant indentification.

The necessity of, and mechanisms for stratification of environmental sampling are presented. This serves as the major basis for revision of the Department of the Army Pesticide Monitoring Program. The revised program further insures reliable monitoring data to support pesticide and pest management program changes. (Katz)
W77-02203

COMPILATION OF STATE DATA FOR EIGHT SELECTED TOXIC SUBSTANCES, VOL. I, FINAL REPORT,
Mitre Corp., McLean, Va.
For primary bibliographic entry see Field 5G.
W77-02204

COMPILATION OF STATE DATA FOR EIGHT SELECTED TOXIC SUBSTANCES, VOL. IV, COMPILATIONS OF SUMMARIES AND ANALYSES OF STATE DATA,
Mitre Corporation, McLean, Va.
For primary bibliographic entry see Field 5G.
W77-02205

AN ECOSYSTEM ANALYSIS OF ENVIRONMENTAL CONTAMINATION BY LEAD,
Illinois Univ. at Urbana-Champagn. Inst. for Environmental Studies.
G. L. Rolfe, and A. Haney.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 593, Price codes: A07 in paper copy, A01 in microfiche. Report to National Science Foundation, August 1975. 133 p. 30 tab., 25 fig., 13 ref.

Descriptors: *Lead, *Metals, *Distribution patterns, *Path of pollutants, Water pollution, *Illinois, Toxicity, Ecological distribution, *Air pollution, Air-water interfaces, Sediments, Freshwater fish, *Food chains, Aquatic animals, Aquatic plants, Freshwater fish, Environmental gradients, Insects, Air-earth interfaces, Watersheds(Basins).
Identifiers: *Tetraethyl lead, Ecosystem analysis, Environmental contamination, *Saline branch watershed(Ill).

An 86-square-mile watershed in east-central Illinois, predominantly agricultural with a small urban area, was studied to determine the movement of lead into and through the area. The accumulation of lead in the terrestrial and aquatic biota were also examined. Combustion of gasoline was found to be the major source of lead input, accounting for 29,000 kg per year. Of this amount, about 13,000 kg remain airborne while 16,000 kg are deposited at ground level. Lead leaves the watershed at a rate of 910 kg per year through drainage water. The balance, 14,800 kg or 92.5 percent of the annual input, remains within the watershed. Lead concentrations in air, soils, stream sediments and the terrestrial and aquatic biota were determined. At present lead concentrations there is no apparent adverse effect on plants and animals. No biological magnification was discovered except in insect food chains. The major lead reservoirs are the soils (9 x 105 kg), plants (4 x 103 kg), and stream sediments (3 x 103 kg). The highest lead concentrations and a major portion of the stored lead are associated with the urban region and with areas adjacent to high-use rural roads. (Katz)
W77-02211

OCCURRENCE OF KEROSENE-LIKE HYDROCARBONS IN THE BREAM, MYLIO AUSTRALIS GUNTHER,
Queensland Dept. of Primary Industries, Hamilton (Australia). Sandy Trout Food Preservation Research Lab.
For primary bibliographic entry see Field 5C.
W77-02212

EFFECT OF ENVIRONMENTAL CONDITIONS ON THE DEGRADATION OF DDT IN MODEL MARINE ECOSYSTEMS,
Cornell Univ., Ithaca, N. Y. Lab. of Soil Microbiology.
For primary bibliographic entry see Field 5C.
W77-02213

A NEW TECHNIQUE FOR REMOTE MONITORING OF ACTIVITY OF FRESHWATER INVERTEBRATES WITH SPECIAL REFERENCE OXYGEN CONSUMPTION BY NIAIDS OF ANAX SP. AND SOMATOCHLORA SP. (ODONATA),
Environmental Protection Agency, Grosse Ile, Mich.
For primary bibliographic entry see Field 5C.
W77-02216

POLYELECTROLYTE PERSISTENCE IN A MUNICIPAL WATER SUPPLY,
Minnesota Univ., Minneapolis. Div. of Environmental Health.
For primary bibliographic entry see Field 5F.
W77-02221

TUBIFICIDS (OLIGOCHAETA: TUBIFICIDAE) - INDICATORS OF THE QUALITY OF WATER BODIES, (IN RUSSIAN),
Akademiya Nauk Latvilskoi SSR, Riga. Inst. of Biology.
E. A. Parele, and E. B. Astapenok.
Latv Psr Zinat Akad Vestis 9, p 44-46, 1975.

Descriptors: Benthos, *Oligochaetes, *Tubificids, *Bioindicators, Europe, *Worms, Water quality, Water pollution, *Pollutant identification.
Identifiers: Latvian-SSR, USSR, Tubificid-aquatic plant associations.

Slightly setaceous worms have the leading role in the freshwater benthos of the Latvian SSR (USSR). Statistical material obtained on oligochaetes in large streams in 1962-1971 showed that tubificid-plant associations can be used as indicator organisms. By mathematical treatment of the data, standard coefficients D2, D3 and D4 weren obtained indicating the degree of the stream saprobiont. To determine coefficient D2, data on the total number of oligochaetes and turbificids is sufficient. To determine coefficients D3 and D4 all species of tubificids must be known.--Copyright 1976, Biological Abstracts, Inc.
W77-02225

THE MERCURY CONTENT OF MOLLUSKS IN THE PONTEVEDRA ESTUARY AS A MEASURE OF ITS DEGREE OF MERCURY CONTAMINATION, (IN SPANISH),
Institut Espanol de Oceanografia, Madrid (Spain). Central Labs.
J. Aravia Torre, and C. Masso.
Bol Inst Esp Oceanogr 191, p 1-10, 1975.

Descriptors: *Mercury, *Mollusks, *Pollutant identification, Estuaries, Water pollution sources, Europe, Clams, Industrial wastes, Pulp wastes, Mussels.
Identifiers: Cockles, Caustic soda, Pontevedra estuary(Spain), Arosa estuary(Spain).

A paper pulp factory and a caustic soda and Cl producing plant on the Pontevedro estuary, NW Spain, contaminated the bay with Hg. The Hg con-

tent of bay mollusks (clams, cockles, mussels) was compared with that of mollusks in a nearby unpolluted bay of the Arosa estuary. Contamination was found in a limited zone near the factories. In mussels 20 ppm Hg was found; 10 ppm was found in clams, and 12 ppm in cockles. The Hg content of mollusks declined rapidly with distance from the contamination source. In the uncontaminated Arosa estuary the average Hg content of fresh mussels was 0.014 ppm. At distant points in the contaminated bay, Hg content in mollusks dropped to 0.03 ppm or lower. The official danger level is 0.50 ppm; mollusk consumption is not restricted.--Copyright 1976, Biological Abstracts, Inc.
W77-02226

SOME ASPECTS OF MUNICIPAL OVERFLOW RESERVOIR MONITORING, (IN SWEDISH),
Uppsala Kommun (Sweden). Halsovard Forvaltning.
C. Forsberg, and S. O. Ryding.
Vatten 31(4), 347-358, 1975.

Descriptors: *Chlorophyll, *Monitoring, *Municipal water, Reservoirs, Vegetation, Nitrogen, Water supply, Phosphorus, *Overflow, Organic matter, *Pollutant identification.
Identifiers: *Sweden.

The effects of vegetation and other variable factors were studied by analyzing chlorophyll a is surface waters of lakes used as overflow reservoirs for the city of Uppsala, Sweden, including lakes Kyrkviken, Ramsjoen and Uttran during the period from May-Oct. for several years. A remarkable variability was recorded; seasonal average values do not reflect water quality. N,P and organic material were measured weekly and monthly and related to water flow for the river Fyris during the whole year of 1973 showing the variation of transport and the effect of sample averaging. Analytical procedures are recommended for testing water quality for overflow water reservoirs. A typical situation is plotted showing the 8 sites where water samples should be analyzed, including sites of inflow of natural waters, sites of outflow, and points where inflow occurs from purification works, where N is important and varies with the input quantity. Test should be made inside the reservoir at points remote from inflow and outflow, and should include 3-5 samples of surface water during vegetation periods and samples from 0-2 m in depth. Another location for analysis represents the influx of P and N from forest and cultivated land. For continual control of water quality, salt, pH, suspended material, organic material, chlorophyll a, N, phosphate P and total P must be determined. Industrial activity, climate and temperature may modify sampling frequency and the degree to which samples can be mixed. Water quality records should reflect actual conditions. Often procedures can be simplified by analyzing mixed samples, but base data are necessary and vary in different communities.--Copyright 1976, Biological Abstracts, Inc.
W77-02228

EMISSION SPECTROMETIC ELEMENT DETERMINATION IN THE NANO- AND PICOGRAM REGION AFTER VAPORIZATION OF THE ELEMENTS WITH GAS PLASMAS INDUCED WITH MICROWAVES: 1. EXTREMELY SENSITIVE MERCURY DETERMINATION IN AQUEOUS SOLUTIONS, AIR ORGANIC AND INORGANIC MATERICES, (IN GERMAN),
Max-Planck-Institut fuer Metallforschung, Stuttgart (West Germany).
G. Kaiser, D. Goetz, P. Schoch, and G. Toelg.
Talanta 22(10/11), p 889-899, 1975.

Descriptors: *Mercury, *Pollutant identification, *Spectrophotometry, Analytical techniques, Trace elements, Measurement, Aqueous solutions.

The Hg in substances to be tested is quantitatively enriched by cementation or electrolytic precipitation on Cu and amalgamation with Ag or Au. It is then vaporized into Ar plasma by heating the carrier metals, and the light emitted is measured with a spectral photometer. All steps of the process are optimized with 203 Hg so that 0.05 ppm Hg may be detected in drinking water, surface water and sewage and may be measured simply and accurately in air and in organic and inorganic matrices. The absolute limit of detectability is 0.1 ng and the coefficient of variability is = or < 10%; the procedure takes about 15 min.--Copyright 1976, Biological Abstracts, Inc.
W77-02229

HYDROCHEMICAL CHARACTERISTICS OF THE OREL RIVER, (IN RUSSIAN),
Dnepropetrovskii Gosudarstvennyi Universitet (USSR). Inst. of Hydrobiology.
N. I. Varenko.
Gidrobiol Zh 11(5), p 79-81, 1975.

Descriptors: *Dissolved oxygen, *Phytoplankton, Rivers, Weather, Water chemistry, Water supply, Data collections, *Pollutant identification.
Identifiers: *Hydrochemical features, *Orel River(USSR), Ukrainian-Ssr, USSR.

Data are given on the chemical composition of the water of the Orel River, a left-bank tributary of the Dnieper River in the Ukrainian SSR (USSR). The chemical composition of the water is very diverse and is determined by a complex of physiographic and meteorological conditions and the water supply of the river. The comparatively high value of dissolved O2 is conditioned by phytoplankton development.--Copyright 1976, Biological Abstracts, Inc.
W77-02234

BIOLOGICAL MONITORING: SUBSTANTIATION AND EXPERIENCE IN ORGANIZATION, (IN RUSSIAN),
Moscow State Univ. (USSR).
V. D. Fedrov.
Gidrobiol Zh 11(5), p 5-11, 1975.

Descriptors: *Monitoring, *Bioindicators, *Bacteria, Biomass, Potable water, Phytoplankton, Productivity, Respiration, Water supply, Europe, *Pollutant identification, Reservoirs.
Identifiers: Substantiation, *Ucha Reservoir(USSR).

Observation and experiment should be the main methods of collecting information in a biological monitoring system. Biological indices are conveniently divided into 2 categories: functional, i.e., the rate of change of some function (indices of productivity, respiration, assimilation, etc.), and structural, i.e., some result of an action at the time of recording (biomass, number of species, content of matter in the system, etc.). These principles were used in setting up a program and organizing biological (phytoplankton, bacterioplankton) monitoring on the Ucha reservoir supplying Moscow (Russian SFSR, USSR) with drinking water.--Copyright 1976, Biological Abstracts, Inc.
W77-02235

TRACE ELEMENTS IN SOILS OF THE DNIEPER-BUG LIMAN, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 2G.
W77-02258

EFFECT OF RIVER POLLUTION ON AQUATIC BEETLES, (IN RUSSIAN),
Rostov-na-Donu Research Inst. of Neurocybernetics (USSR).
V. A. Minoranskii, and N. B. Dzhumailo.
Izv Sev-Kavk Nauchn Tsentra Vyssh Shk Estestv Nauki 3(3), p 92-93, 1975.

Descriptors: Water pollution effects, Indicators, Rivers, *Aquatic insects, *Bioindicators, Water quality, *Pollutant identification.
Identifiers: *Aquatic beetles, Don River(USSR), *Temernik River(USSR), Rheophils, Potamophils, Limnophils.

Aquatic beetles (17 spp.) were collected in the relatively clean Don River and 17 spp. in the polluted Temernik River flowing into the Don. Only 6 spp. were common to both rivers. The dominant species of beetles in these rivers were also different. In the Don 64.7% of all species were rheophils and potamophils; in the Temernik 82.3% were limnophils. Aquatic beetles can serve as indicators of the purity of rivers.--Copyright 1976, Biological Abstracts, Inc.
W77-02261

EXTRACTION-PHOTOMETRIC DETERMINATION OF MERCURY IN SOIL AND WATER, (IN RUSSIAN),
Uzhgorod State Univ. (USSR).
P. P. Kish, G. M. Vitenko, V. A. Sabov, and V. I. Buletsa.
Gig Sanit 11, p 74-76, 1975.

Descriptors: *Mercury, *Pollutant identification, *Photometry, *Soil analysis, *Water analysis, Separation techniques, Analytical techniques, Ions.

A proposed method of extraction-photometric determination of microquantities of Hg in soil and water is based on the extraction by benzene of the ion association formed by the anionic I complex of Hg with the action reagent methyl violet. The method is highly sensitive and permits simultaneous concentration and determination of Hg from greatly diluted solutions containing Hg to 0.002 microgram/ml. The determination of Hg is not disturbed by the presence of Zn,Cd,Mn,Co,Cu,Fe,Al,Pb,Cr or some other elements. The method is distinguished by good reproducibility and accuracy.--Copyright 1976, Biological Abstracts, Inc.
W77-02272

CASE OF SUBSURFACE WATER POLLUTION BY PETROLEUM PRODUCT WASTES, (IN RUSSIAN),
Meditsinskii Institut, Tselinograd (USSR).
For primary bibliographic entry see Field 5B.
W77-02273

COMPARISON OF METHODS FOR THE DETERMINATION OF TOTAL PHOSPHORUS IN WATERS CONTAINING PARTICULATE MATERIAL,
Massey Univ., Palmerston North (New Zealand). Dept. of Soil Science.
P. W. O'Connor, and J. K. Syers.
Journal of Environmental Quality, Vol. 4, No. 3, 1975. p 347-350, 4 tab, 18 ref.

Descriptors: *Phosphorus, Water quality, Water quality control, Water sampling, Sediments, *Pollutant identification, Methodology, Analytical techniques.

Perchloric acid digestion compared favorably with Na2CO3 fusion for the determination of total P in a range of waters containing varying concentrations of both P and particulate material. The recovery of particulate P by persulfate digestion tended to decrease with increasing particulate material concentration in both natural unfiltered samples and in filtered samples to which particulate material was added. Recovery of added soil particulate P by persulfate digestion also decreased with increasing particle size. Low recovery of P by persulfate digestion was caused by the incomplete extraction of P occluded within oxides and hydrous oxides of iron. Between 58 and 86% of the P not recovered by persulfate digestion

was in the inorganic form. Persulfate digestion is not recommended for the determination of total P in waters containing particulate inorganic materials of soil origin. Perchloric acid digestion is considered to be a more suitable method for such samples. (Skogerboe-Colo St)
W77-02293

DESCRIPTIONS AND CHEMICAL ANALYSES FOR SELECTED WELLS IN THE CENTRAL SACRAMENTO VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-02299

WATER-QUALITY STUDY OF A REACH OF THE MERCED RIVER IN YOSEMITE NATIONAL PARK AND VICINITY, CALIFORNIA--APRIL 1973 THROUGH SEPTEMBER 1974,
Geological Survey, Menlo Park, Calif. Water Resources Div.
R. J. Hoffman, A. E. Dong, and G. L. Keeter.
Open-file report 76-326, August 1976. 66 p, 7 fig, 17 tab, 19 ref.

Descriptors: *Water quality, *Baseline studies, Sewage treatment, *Water analysis, *Chemical analysis, Biological properties, Chemical properties, Physical properties, Data collections, *California, Treatment facilities.
Identifiers: *Yosemite National Park(Calif), Preconstruction, Sewage plants.

A 25-mile reach of the Merced River was studied to provide the U.S. National Park Service with water-quality data prior to the operation of a new sewage treatment plant. Water-quality variables investigated were discharge, temperature, major chemical constituents, selected trace metals, specific conductance, suspended sediment, turbidity, dissolved oxygen, pH, total alkalinity, carbon dioxide, total organic carbon, nitrogen, phosphorus, algal growth potential, coliform bacteria, periphyton, and benthic invertebrates. Results indicate that water in the reach of the Merced River studied is a dilute system of good quality. Mean concentrations of nitrogen and phosphorus were highest in the Merced River at Rancheria Flat. Algal growth potential tests revealed that phosphorus was limiting algal growth at Happy Isles Bridge, El Capitan Bridge, and South Fork Merced River, which nitrogen was limiting it at Rancheria Flat. Input of excessive nitrogen and phosphorus concentrations in the Merced River during the summer low-flow period, and mixing with warm tributary inflow could cause excessive algal growth and production. (Woodard-USGS)
W77-02309

THE MERIDIAN-UPPER WILCOX AQUIFER IN MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-02310

MAPS SHOWING GROUND-WATER CONDITIONS IN THE LOWER BIG CHINO VALLEY AND WILLIAMSON VALLEY AREAS, YAVAPAI AND COCONINO COUNTIES, ARIZONA,
Geological Survey, Tucson, Ariz. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-02312

HYDROLOGY OF LAKE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-02316

GROUND-WATER RESOURCES AND GEOLOGY OF ST. CROIX COUNTY, WISCONSIN,
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-02321

GROUND-WATER HYDROLOGY OF THE COCOA WELL-FIELD AREA, ORANGE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-02323

FLUID SAMPLER AND OXYGEN METER FOR SEWAGE PROCESSING - BIOLOGICAL OXYGEN DEMAND DETAILED CONTINUOUSLY BY REACTION VESSEL READ-OUT.
French Patent FR 2289-451. Issued August 4, 1975. Derwent French Patents Abstracts, Vol. X, No. 36, p D3-D4, May 28, 1976.

Descriptors: *Patents, *Biochemical oxygen demand, *Sewage treatment, *Monitoring, *Activated sludge, Biological treatment, Aeration, Equipment, Analytical techniques, Instrumentation, *Pollutant identification.

A patent for a biochemical oxygen demand metering device which can be used in activated sludge type sewage treatment installations is described. The device has a reaction vessel which constantly receives a sample from the aeration tank and through which air is caused to flow. A vent is provided to allow air leaving the liquid sewage to escape into the atmosphere. Air from the vent can be conducted to an oxygen metering instrument in a second section of the device. A third section of the reactor is provided for feeding in the liquid sample, and a fourth section takes overflow back to the aeration tank. The device provides continuous biochemical oxygen demand readings in a minimum amount of time and is protected from soiling, clogging, and corrosion. (Kreager-FIRL)
W77-02340

CORRELATION OF BOD, COD AND SOLUBLE ORGANIC CARBON,
ADI Ltd., Fredericton (New Brunswick).
T. Viraraghavan.
Journal Water Pollution Control Federation, Vol. 48, No. 9, p 2213-2214, September, 1976. 2 tab, 4 ref.

Descriptors: *Carbon, *Organic compounds, *Biochemical oxygen demand, *Chemical oxygen demand, *Waste water(Pollution), Sewage, Groundwater, Septic tanks, Effluents, Analytical techniques, Solubility, Statistics, *Pollutant identification.
Identifiers: *Organic carbon(Soluble).

The degree of correlation between soluble organic carbon and oxygen demand (biochemical and chemical) was investigated for samples of raw sewage, septic tank effluent, and polluted groundwater. Biochemical and chemical oxygen demand were estimated by using the procedures in Standard Methods, and soluble organic carbon was measured by analyzing the filtrates of samples filtered through 24.25-centimeter glass fiber filters for organic carbon. The correlation coefficients between soluble organic carbon and biochemical or chemical oxygen demand for raw sewage and septic tank effluent were not significant at the 5% level; polluted groundwater also failed to show a significant correlation at the 5% level for soluble organic carbon and biochemical oxygen demand, although the correlation between the former and chemical oxygen demand was significant at the 1% level. Thus, the use of soluble organic carbon as a measure of organic matter in waste water should be made with caution. (Kreager-FIRL)
W77-02376

DETERMINATION OF CHEMICAL OXYGEN DEMAND (DIE BESTIMMUNG DER CHEMISCHEN OXIDIERBARKEIT),
F. J. Sprenger.
Vom Wasser, Vol. 46, p 125-138, 1976. 1 tab, 10 ref.

Descriptors: *Chemical oxygen demand, *Analytical techniques, Waste water(Pollution), *Organic compounds, *Oxidation, Chemical reactions, Kinetics, Temperature, Acidity, Alkalinity, Chlorides, *Pollutant identification.
Identifiers: Oxidizing agents, Potassium permanganate, Potassium dichromate.

The determination of chemical oxygen demand in water with dissolved organic compounds is discussed. Chemical oxygen demand determinations are made by oxidizing the organic matter in the water as completely as possible so that carbon dioxide and water are the final products. Preferred oxidizing agents include potassium permanganate in alkaline or acid solutions and potassium dichromate in acid solution. Generally, higher rates of oxidation are achieved with the latter compound. Although higher rates of oxidation may be obtained by increasing temperature and sulfuric acid concentration of the sample, secondary effects involving the simultaneous oxidation of chlorides rule out such means as being practical. (Kreager-FIRL)
W77-02380

INSTANTANEOUS METERING AIDS - ACTIVATED SLUDGE PLANT,
Suffolk County Dept. of Environmental Control, Hauppauge, N. Y. Operations Div.
B. A. Matzner.
Water and Wastes Engineering, Vol. 13, No. 8, p 18-20, August, 1976.

Descriptors: *Pollutant identification, *Analytical techniques, *Monitoring, *Suspended solids, *Aeration, *Biological treatment, Activated sludge, Nitrification, Denitrification, Sewage treatment, Waste water treatment, Liquid wastes, Feasibility, Performance, Evaluation Measurement, Treatment facilities, On-site investigations, Automation.

The feasibility of using an automatic instrument for the instantaneous measurement of mixed liquor suspended solids in the aeration tank of an activated sludge municipal treatment plant with extended aeration nitrification and suspended growth denitrification was demonstrated. The analyzer consists of two parts connected with cables: a sensing probe (mounted on the downflow side in the center of the aeration tank) and a remotely located indicator assembly which gives a direct digital readout in ppm. In the event of a decrease in solids in the mixed liquor, the analyzer alerts the operator to introduce additional solids into the aeration tank. When the solids reach the top of the optimum ppm range, as indicated by the automatic analyzer, the operator turns off the return sludge system and begins wasting sludge from the clarifiers. Continuous testing of the analyzer at the sewage treatment plant indicates that the instrument is reliable and provides an accurate measure of mixed liquor suspended solids. (Kreager-FIRL)
W77-02381

A STUDY OF BACTERIAL AEROSOLS AT A WASTEWATER IRRIGATION SITE,
Army Medical Bioengineering Research and Development Lab., Frederick, Md.
C. A. Sorber, H. T. Bausum, S. A. Schaub,, and M. J. Small.
Journal Water Pollution Control Federation, Vol. 48, No. 10, p 2367-2379, October, 1976. 7 fig, 7 tab, 13 ref.

Descriptors: *Irrigation, *Air pollution, *Aerosols, *Bacteria, *Waste water treatment,

*Water reuse, Recreation facilities, On-site investigations, Sprays, Chlorination, Microorganisms, Efficiencies, Coliforms, Public health, *Pollutant identification.
Identifiers: Klebsiella.

A 4-week field study at a golf course irrigated with chlorinated secondary effluent was conducted to obtain data for a model designed to predict pathogen levels downwind from the spray source. Bacterial aerosols significantly above background were demonstrated at 198 m downwind from the nozzle, the greatest distance tested. At 152 m from the source, total aerobic counts of about 100/cu m and coliform-like counts of about 30/cu m were recorded. Among the isolates confirmed as coliforms biochemically, 58% were assigned to the genus Klebsiella; this is of public health significance since these bacteria are capable of producing respiratory and other infections in man. In two runs where chlorination was practiced, the mean reduction in total aerobic count observed at the irrigation spray nozzle was 99.6%, illustrating the effectiveness of this treatment for controlling the microbial aerosol problem. (Kreager-FIRL)
W77-02392

GAS AND LEACHATE FROM LANDFILLS: FORMATION, COLLECTION, AND TREATMENT. PROCEEDINGS OF A RESEARCH SYMPOSIUM.
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5E.
W77-02394

ANALYTICAL METHODOLOGIES FOR LEACHATE AND GAS ANALYSIS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
E. S. K. Chian, and F. B. DeWalle.
In: Symposium on Gas and Leachate from Landfills: Formation, Collection, and Treatment, March 25-26, 1975, New Brunswick, New Jersey, Department of Environmental Science, Rutgers University, p 44-53. 4 fig. 15 ref.

Descriptors: *Pollutant identification, *Leachate, *Landfills, *Analytical techniques, *Sampling, *Chemical analysis, Conductivity, Color, Turbidity, Suspended solids, Nitrogen, Chemical oxygen demand, Physical properties, Chemical properties, Colorimetry, Heavy metals, Organic compounds.

Techniques for sampling and analyzing leachate samples from landfills are discussed. Strict anaerobic sampling and storage conditions are necessary to prevent extensive changes from occurring in the leachate sample prior to analysis. Samples should be stored in glass bottles for organic analysis and in plastic bottles for heavy metal analysis. The sequence of parameter analysis should be: oxidation-reduction potential, color, turbidity, suspended solids, pH, and conductivity. Other parameters such as chemical oxygen demand and organic nitrogen may also change directly after sampling, but these changes can be reduced by acidifying the sample. Chemical analysis using colorimetric methods is strongly interfered with by color, suspended solids, and high salt concentrations in the leachate. These interfering effects can be reduced by using a standard addition method or by diluting the leachate sample with increasing amounts of water to determine whether the interfering effect can be sufficiently reduced. (See also W77-02394) (Kreager-FIRL)
W77-02402

VARIATIONS IN GAS AND LEACHATE PRODUCTION FROM BALED AND NON-BALED MUNICIPAL REFUSE,
Systems Technology Corp., Dayton, Ohio.
For primary bibliographic entry see Field 5E.
W77-02404

GAS AND LEACHATE GENERATION IN VARIOUS SOLID WASTE ENVIRONMENTS,
Systems Technology Corp., Dayton, Ohio.
For primary bibliographic entry see Field 5E.
W77-02405

MONITORING TOXIC CHEMICALS IN LAND DISPOSAL SITES,
Illinois State Water Survey, Urbana.
W. H. Walker.
In: Symposium on Gas and Leachate from Landfills: Formation, Collection, and Treatment, March 25-26, 1975, New Brunswick, New Jersey, Department of Environmental Science, Rutgers University, p 123-129. 3 fig, 1 ref.

Descriptors: *Monitoring, *Landfills, *Groundwater, *Sampling, *Cores, Chemical analysis, Soil tests, Water pollution, Waste disposal, Solid wastes, *Pollutant identification.

Toxic chemical monitoring at landfill sites is discussed. Recent studies indicate that well monitoring systems may not be the most effective means to trace chemical pollutant flow paths or to determine groundwater chemical concentrations at any time or depth. Instead, chemical analyses of core samples from the underlying earth material profile may be preferred since these allow for a positive definition of any chemical constituent within the profile at any given location. This is true regardless of whether the chemicals are present in precipitated form in the zone of aeration, are held by retention on soil particles in the semisaturated fringe, or are dissolved in groundwater within the zone of saturation. Core sample monitoring is also faster and more economical than well monitoring. The number of sampling points required is primarily controlled by the expected variability of each parameter and the degree of monitoring accuracy desired. Initial soil core test probes which are made to obtain background data should be placed at the center of each sampling station. (See also W77-02394) (Kreager-FIRL)
W77-02409

NONPOINT-SOURCE POLLUTION IN SURFACE WATERS: ASSOCIATED PROBLEMS AND INVESTIGATIVE TECHNIQUES.
National Environmental Research Center, Las Vegas, Nev. Monitoring Applications Lab.
For primary bibliographic entry see Field 5B.
W77-02444

NATIONAL ENVIRONMENTAL STATISTICAL REPORT,
Mitre Corp., McLean, Va.
For primary bibliographic entry see Field 7C.
W77-02447

AN EVALUATION OF WATER QUALITY INFORMATION: A CASE STUDY OF STREAMS IN METROPOLITAN NEW JERSEY,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Geography.
R. M. Hordon.
Trans Ill State Acad Sci. 66(3/4), p 105-114, 1973.

Descriptors: *New Jersey, *Water quality, Urbanization, Data collections, Streams, River basins, Bacteria, Alkalinity, Color, Temperature, Hydrogen ion concentration, Dissolved oxygen, Computer programs, Biochemical oxygen demand, Pollutant identification, Turbidity.
Identifiers: Raritan River basin(NJ).

Some of the best water quality data sets available in New Jersey are routinely collected by large public potable water supply agencies. One set consisted of 11 variables (temperature, dissolved oxygen, turbidity, color, discharge, percent saturation, hardness, alkalinity biological oxygen demand (BOD), pH and bacteria) collected every week at 3 sites in the Raritan River Basin. Factor analysis using the Varimax rotation resulted in 3 factors: an oxygen-related factor (high inverse loadings on dissolved oxygen and temperature), an appearance factor (turbidity, color and discharge), and a 3rd variable factor occasionally loading on percent saturation. The cumulative percentage explained by the rotated factors declined during the decade, suggesting an increase in independence developing among the variables. It is hypothesized that urbanization with its commensurate changes in land use and runoff patterns might be intervening in the natural ecology of the stream. The effects of urbanization would interfere with instream interaction among the variables. Factor structures were quantitatively compared from year to year and from site to site by a computer program called RELATE.--Copyright 1975, Biological Abstracts, Inc.
W77-02448

A SIMPLE APPARATUS FOR METERING VOLATILE LIQUIDS INTO WATER,
National Marine Fisheries Service, Tiburon, Calif. Tiburon Fisheries Lab.
For primary bibliographic entry see Field 7B.
W77-02454

DIRECT OF X-RAY SPECTROMETRIC DETERMINATION OF BROMINE IN WATER,
Geological Survey of Israel, Jerusalem. Geochemical Dept.
Y. Deutsch.
Anal Chem. 46(3), p 437-440, 1974.

Descriptors: *Pollutant identification, *Bromine, *X-ray spectroscopy, Water analysis, Spectroscopy.

A rapid X-ray spectrometric method for the routine determination of bromine in water is based on the normalization of the background intensity of the sample to the background intensity of a pure water sample. Results agree fairly well with results of the standard oxidation reduction method. X-ray results for synthetic samples are very good, with a maximum error of 2%.--Copyright 1974, Biological Abstracts, Inc.
W77-02457

ARE THE CHESAPEAKE BAY WATERS WARMING UP,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 2L.
W77-02472

MONITORING WATER QUALITY FROM LANDSAT.
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
J. L. Barker.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-11543, Price Codes: A03 in paper copy, A01 in microfiche. Preprint X-923-75-190, July 1975. 33 p, 18 fig, 7 tab.

Descriptors: *Remote sensing, *Virginia, *Water quality, *Reservoirs, Satellites(Artificial), Data processing, Reflectance, Turbidity, Suspended solids, Land use, Mapping, Runoff, *Monitoring, Measurement, Pollutants, Water pollution sources, *Pollutant identification.
Identifiers: *LANDSAT, Areal measurements.

Water quality monitoring possibilities from LANDSAT were demonstrated both for direct readings of reflectances from the water and indirect monitoring of changes in use of land surrounding Swift Creek Reservoir in a joint project with the Virginia State Water Control Board and NASA. Film products were shown to have insufficient resolution, and all work was done by digitally processing computer compatible tapes. It was

shown that areas of individual water bodies could be measured from LANDSAT with an accuracy that decreased from + or - 1% at 500 hectares to + or - 8% at 5 hectares. LANDSAT reflectances from water in the visible (MSS-4 and MSS-5) and near-infrared (MSS-6) spectral bands were shown to be nearly perfectly correlated and spatially coherent for both Swift Creek Reservoir and Lake Chesdin Reservoir, which has a ten times greater flow rate due to input from the Appomatox River. Perhaps the greatest potential contribution of LANDSAT is through indirect interpretation by detecting changes in land cover in a watershed. Land cover maps of the 18,000 hectare Swift Creek Reservoir watershed were prepared for two dates in 1974. A significant decrease in the pine cover was observed in a 740 hectare construction site within the watershed. A measure of the accuracy of classification was obtained by comparing the LANDSAT results with visual classification at five sites on a U-2 photograph. Such changes in land cover can alert personnel to watch for potential changes in water quality. (Sims-ISWS)
W77-02494

REMOTE SENSING OF EFFECTS OF LAND-USE PRACTICES ON WATER QUALITY,
Kentucky Univ., Lexington. Dept. of Forestry.
D. H. Graves.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-1[illegible]525, Price codes: A02 in paper copy, A01 in microfiche. Report NASA CR-144105, December 1975. 17 p, 3 ref, 2 append. NASA NAS8-31006.

Descriptors: *Remote sensing, *Land use, *Forests, *Water quality, Satellites(Artificial), Aircraft, Aerial photography, Data processing, Watersheds(Basins), Vegetation, Vegetation effects, Surveys, *Pollutant identification.
Identifiers: *LANDSAT.

Six watersheds having a total area of 539 hectares (1330 acres) comprised the study area. All six study watersheds were forested, but two had been partially surface mined. One watershed had been fertilized with ammonium nitrate, and another was tentatively scheduled for logging in the summer of 1976. The other two watersheds were utilized as controls. Vegetative ground truth survey was begun in February, 1975. The ground truth survey of forest types was completed by May 1, 1975. Receipt in May of 1:24,000 MSS and CIR imagery from the April 7, 1975 NASA aircraft over-flight of the study areas permitted vegetative typing of the reclaimed sites. Water quality and quantity information was collected for each study watershed. Each watershed was instrumented with a weir, water stage recorder, and precipitation gage. Weekly grab samples were taken at each weir and analyzed for several water quality parameters. Physical parameters measured included turbidity, temperature, and suspended sediment. It was mentioned that color infrared and multispectral imagery from the aircraft overflights and LANDSAT imagery were to be used for land classification and change detection. Also, aircraft and satellite multispectral imagery was to be color enhanced, and the resultant enhanced imagery was to be utilized to supplement the data yield of the primary imagery. Several types of land use change were indicated by LANDSAT imagery and color composites. Appendixes contain two papers recently presented. (Sims-ISWS)
W77-02497

MULTIDISCIPLINARY APPLICATION OF LANDSAT-2 DATA TO MARINE ENVIRONMENT IN CENTRAL JAPAN,
Toba Merchant Marine Coll. (Japan).
For primary bibliographic entry see Field 2L.
W77-02498

USE OF LANDSAT DATA FOR NATURAL RESOURCES INVESTIGATION IN THE LOWER BASIN OF DANUBE AND DANUBE DELTA,
Institutul de Constructii din Bucuresti (Rumania). Lab. for Remote Sensing.
For primary bibliographic entry see Field 2L.
W77-02503

SKYLAB STUDY OF WATER QUALITY,
Geological Survey, Lawrence, Kans.
H. L. Yarger, and J. R. McCauley.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-17460, Price codes: A03 in paper copy, A01 in microfiche. Report NASA-CR-144505, Final Report, EREP No. 540G-1, 38 p, July 1975. 16 fig, 3 tab, 2 ref, 1 append. NAS-9-13271.

Descriptors: *Reservoirs, *Water quality, *Impounded waters, Water properties, *Suspended solids, *Kansas, Impoundments, Surface waters, Domestic water, Recreation, Eutrophication, Mineralogy, Nutrients, Water analysis, Water chemistry, Suspension, Satellites(Artificial), Water resources, Dissolved solids, *Pollutant identification.
Identifiers: *SKYLAB, *Mineral constituents, Inorganic sediment, Reflected energy, Artificial reservoirs, Algal nutrients.

Apparent reflectance lvels inl the SKYLAB S190A and S192 bands, from one pass over three Kansas reservoirs, exhibit good statistical correlation with suspended solids. Band ratios appear to yield the best results. The concentration of suspended solids, mostly inorganic sediment, has the most effect on the reflected energy. Dissolved solids concentrations up to 200 ppm were not detectable by the SKYLAB sensors. (Henley-ISWS)
W77-02505

OZONE REMOVAL FROM ARC LAMP COOLING AIR,
Auburn Univ., Ala. Charles Richard Saunders Chemical Lab.
For primary bibliographic entry see Field 7B.
W77-02511

BIO-REFRACTORY INDEX FOR ORGANICS IN WATER,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
F. L. Hart, and T. Helfgott.
Water Research, Vol 9, p 1055-1058. 1975. 3 tab, 12 ref. OWRT A-030-CONN(8), 14-31-0001-3007.

Descriptors: *Organic compounds, *Aquatic environment, Persistence, *Oxygen demand, *Nitrogen, Industrial waste, Laboratory tests, *Biodegradation, *Pollutant identification, Degradation(Decomposition).
Identifiers: *Refractory index, *Degree of degradation.

A method of classifying specific aquatic borne organic materials according to degradability is presented. Laboratory procedures and rationale are given for the development of a parameter referred to as the Refractory Index (R.I.). Examples of refractory index values and significance are offered. Representative data are presented for which there is roughly a 13% relative error for each R.I. value. Materials characterized as refractory (having a low R.I. value) are persistent for the conditions stipulated in the ultimate BOD test and therefore low R.I. indicates persistence in the water environment. Materials having low R.I. values should not be discharged in receiving waters unless extensive examinations show that the material can be effectively removed by treatment or does not cause harmful effects in the aquatic environment. (de Lara-Connecticut)
W77-02520

ENVIRONMENT AND POLLUTIONS. SOURCES, HEALTH EFFECTS, MONITORING AND CONTROL,
For primary bibliographic entry see Field 5G.
W77-02521

A SENSITIVE ALGAL ASSAY: AN IMPROVED METHOD FOR ANALYSIS OF FRESHWATERS,
Connecticut Univ., Storrs. Inst. of Water Resources.
R. L. Klotz, J. R. Cain, and F. R. Trainor.
Journal of Phycology, Vol. 11, No. 4, p 411-414, 1975. 1 fig, 6 tab, 10 ref. OWRT A-052-CONN(13), 14-31-0001-3807.

Descriptors: *Bioassay, *Aquatic algae, Freshwater, *Carrying capacity, *Connecticut, Pollutant identification, Nutrients.
Identifiers: *Algal assay, Dilute medium, *Selenastrum, *Sensitive assay, *Nutrient-poor rivers, Willimantic/Shetucket River(Conn), Natchaug River.

An algal assay capable of detecting the carrying capacity of nutrient-poor rivers was developed. In order to eliminate carry-over of nutrients, thus masking the true nutrient condition of the water tested, a new growth medium was developed. This maintenance medium contained less than 4 mg/l total inorganic salts. With an inoculum of 104 cells/ml the test organism Selenastrum capricornutum Printz was grown in sterile-filtered river water and transferred daily with a 1:1 dilution. The assay was carried out for 4 or 5 days, at which time cell number was calculated, and the doublings per day were determined. Comparisons are made with similar but less sensitive assays, on the basis of both daily and 5-day readings. (de Lara-Connecticut)
W77-02524

DISTRIBUTION OF AQUATIC YEASTS - EFFECT OF INCUBATION TEMPERATURE AND CHLORAMPHENICOL CONCENTRATION ON ISOLATION,
Connecticut Univ., Noank. Marine Research Lab.
J. D. Buck.
Mycopathologia, Vol. 56, No. 2, p 73-79, 1975. 1 fig, 4 tab, 30 ref. OWRT A-052-CONN(14). OWRT 14-31-0001-3807.

Descriptors: *Yeasts, *Aquatic microorganisms, Rivers, Estuaries, *Marine fungi, Temperature, *Incubation, *Connecticut, Coasts, Isolation, Sewage treatment, Filters, Membranes, Filtration, Waste water treatment.
Identifiers: *Chloramphenicol, *Candida, *Torulopsis, *Membrane filter techniques.

Fresh (river), estuarine and marine waters in and along the coastline of Connecticut were cultured by the membrane filter technique at 20 and 37C on a complex medium containing 0-1000 mg/l of chloramphenicol. Using counts on medium with 500 mg/l antibiotic as a base, ratios of total and pink yeast counts were recorded for other chloramphenicol concentrations at both temperatures for the waters sampled. Variable results were obtained; in general, both total and pink yeast counts decreased with increasing antibiotic levels, being most apparent at 400 mg/l chloramphenicol. Medium without antibiotic and with 100 mg/l always produced bacterial overgrowth. A total of 209 white yeasts were isolated from all platings; the genera Torulopsis, particularly T. candida, and Candida were dominant with lesser numbers of Cryptococcus, Trichosporon, sporogenous genera, and Kloeckera. Most species isolated were found on media at all chloramphenicol levels. Comparisons were made of yeast distributions in these temperate waters with reports from other areas. (de Lara-Connecticut)
W77-02525

THE EUTROPHICATION IMPLICATIONS OF INTERACTIONS BETWEEN NATURALLY OCCURRING PARTICULATES AND METHANE OXIDIZING BACTERIA,
Ohio State Univ., Columbus. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-02536

MODIFICATION OF A COMMERCIAL SPECTROFLUOROMETER FOR RAPID DETERMINATION OF NEAR INFRARED EMISSION,
Auburn Univ., Ala. Charles Richard Saunders Chemical Lab.
For primary bibliographic entry see Field 2K.
W77-02537

LIPIDS OF SMITTIUM CULISETAE,
Ohio State Univ., Columbus. Dept. of Microbiology.
M. A. Patrick, V. K. Sanger, and P. R. Dugan.
Mycologia, Vol. 65, No. 1, p. 122-127, Jan.-Feb., 1973. 2 tab, 14 ref. OWRT A-024-OHIO(2).

Descriptors: *Lipids, *Gas chromatography, *Pollutant identification, Chromatography, Analytical techniques, Organic compounds, Organic acids.
Identifiers: *Smittium culisetae, *Thin-layer chromatography, Triglycerides, Diglycerides, Fatty acids, Steroids.

Neutral and polar lipids of Smittium culisetae were separated by silicic acid column and thin-layer chromatography. 76.3% of the total lipids was found to be neutral lipids and 23.7% was polar. Triglycerides were the most abundant (26.6%) of the lipids with lesser amounts of free fatty acids, steriods and diglycerides. The major phosphatide was phosphatidyl choline (17.8%) while phosphatidyl ethanolamine and phosphatidyl serine were present in smaller amounts. Gas chromatography of methyl esters of the fatty acids obtained from the individual lipid classes showed that the most abundant unsaturated fatty acid was palmitoleic (38.7%) and the predominant saturated fatty acid was palmitic (34.3%). (Chao-Ohio St)
W77-02547

THE ROLE OF SOLAR ULTRAVIOLET RADIATION IN 'NATURAL' WATER PURIFICATION,
Kentucky Univ., Lexington. Dept. of Radiation Medicine.
For primary bibliographic entry see Field 5D.
W77-02552

ORGANIC COMPOUNDS IN PULP MILL LAGOON DISCHARGE,
Washington Univ., Seattle. Coll. of Forest Resources.
B. F. Hrutfiord, T. S. Friberg, D. F. Wilson, and J. R. Wilson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 900, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-660/2-75-028, June, 1975. 69 p, 14 fig, 24 ref, 16 tab.

Descriptors: *Pulp wastes, *Organic compounds, *Aerated lagoons, *Discharge(Water), Wastes, Industrial wastes, Water pollution sources, Phenols, Acids, Liquid wastes, Aromatic compounds, Organic wastes, Waste treatment, Waste water treatment, Water pollution treatment, Water pollution control, Pulp and paper industry, Washington, Pacific Northwest U. S., Effluents, *Pollutant identification.
Identifiers: Terpenes, Resin acids, Fatty acids, Sugar acids, Terpineol, Camphor, Kraft mills.

Organic compounds entering and leaving kraft mill aerated lagoons have been identified and determined quantitatively. The compounds found included terpenes, resin and fatty acids, phenols, and sugar acids. The terpenes,resin and fatty acids are similar to those present in the wood species being pulped. Some terpenes, phenols, and sugar acids are produced during the pulping reactions. About 8 ppm total terpenes were found in the lagoon influent and 1 ppm or less in the effluent. Alpha-terpineol was the major compound entering the lagoon, and camphor the main terpene in the effluent. The total resin acid concentration entering the lagoon was 3.2 ppm, with 0.6 ppm leaving. Fatty acids were lower, both entering and leaving the lagoon. Sugar acids were entering at about 100 ppm, but were usually eliminated in the lagoon. Terpenes can be controlled by in-process steam stripping, and the other compounds can be partially controlled by in-plant spill containment. (Witt-IPC)
W77-02558

THE USE OF TENAX FOR THE EXTRACTION OF PESTICIDES AND POLYCHLORINATED BIPHENYLS FROM WATER. II. TESTS WITH ARTIFICIALLY POLLUTED AND NATURAL WATERS,
Rome Univ. (Italy).
For primary bibliographic entry see Field 5G.
W77-02561

CHEMICAL CATALYST INTERFERENCE IN THE WINKLER TITRATION DETERMINATION OF DISSOLVED OXYGEN -- A METHOD FOR CORRECTION,
Mixing Equipment Co., Inc., Rochester, N.Y.
M. B. Lakin.
Water Research, Vol. 10, No. 11, p 961-966, 1976. 2 fig, 5 ref.

Descriptors: *Water analysis, *Dissolved oxygen, Catalysts, *Volumetric analysis, Cobalt, Chemical precipitation, Oxidation, Analytical techniques, Chemical analysis, Water chemistry, Water quality, *Pollutant identification.
Identifiers: *Winkler test, Sodium sulfite.

A new procedure involving the measurement of a chemical blank is introduced to correct the cobalt interference effect associated with the Winkler titration analysis for dissolved oxygen. Unsteady-state reaeration studies employed for mechanical aerator evaluation tests show that when sodium sulfite is used in the presence of a cobalt ion catalyst to deoxygenate the test basin water, a chemical interference is detected in the Winkler determination of dissolved oxygen content. The interference is attributed to a chemical precipitate that forms in the reaeration process. Evidence suggests that the Co(II) ion is oxidized to the (III) oxidation state forming a cobalt (III) hydroxide in the alkaline test environment. Upon acidification of the test samples during the Winkler procedure, the CO(III), a powerful oxidizing agent, is released and in turn effects an increase in the amount of free iodine released and measured by titration. The additional iodine liberated in this manner yields erroneous oxygen concentration values which are then used to calculate the oxygen mass transfer coefficient. Considerable deviation from the true value of the coefficient can result. (Witt-IPC)
W77-02564

5B. Sources Of Pollution

UTILITY OF URBAN RUNOFF MODELING, (PROCEEDINGS OF A SPECIAL SESSION, SPRING ANNUAL MEETING, AMERICAN GEOPHYSICAL UNION, WASHINGTON, D.C. 14 APRIL 1976.
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 2A.
W77-02076

EFFECTS OF SELECTED CHEMICALS ON MOVEMENT, GROWTH AND SURVIVAL OF CERTAIN AQUATIC ANIMAL LIFE,
Kansas Univ., Lawrence. Dept. of Physiology and Cell Biology.
For primary bibliographic entry see Field 5C.
W77-02084

SEPTIC TANK EFFLUENT MOVEMENT THROUGH SOIL,
Maine Univ. at Orono. Dept. of Soil Chemistry.
E. G. Lotse.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 368, Price codes: A05 in paper copy, A01 in microfiche. Maine Land and Water Resources Institute, Orono, Completion Report, June 1976. 71 p, 30 fig, 6 tab, 22 ref. OWRT A-029-ME(1).

Descriptors: Soils, Phosphorus, Nitrogen, Sorption, Effluents, *Septic tanks, *Nutrient removal, *Path of pollutants, Maine, Nitrates, Dispersion, Diffusion, Soil water movement, Ammonium, Water pollution sources, Waste water treatment.
Identifiers: Septic tank effluent, *Phosphorus removal, *Nitrogen removal, Adsorption fields(Septic tanks).

The rate and extent of phosphorus and nitrogen movement in selected Maine soils were studied under continuous and intermittent loading. Conditions approximating those of septic tank adsorption fields were simulated. For intermittently operated columns, there was no breakthrough of phosphorus when 8.0, 12.4 and 15.0 pore volumes of effluent, respectively, had been collected. For continuously operated columns, however, breakthrough occurred at 10.8 and 11.2 pore volumes, respectively. The greater the hydraulic loading, the greater was the rate of phosphorus movement through a given soil. Septic tank adsorption field systems should have several trenches and large total length of trench in order to minimize the movement of phosphorus and contamination of groundwaters. Nitrate breakthrough occurred before one pore volume of effluent had been collected from each column. The rate of diffusive and dispersive transport appeared to be low compared to the rate of convective transport. Ammonium breakthrough occurred when 2.5 to 6.5 pore volumes of effluent had been collected. The rate of ammonium movement was higher under continuous loading than under intermittent loading conditions. The septic tank adsorption field system is inefficient in removing nitrogen from sewage effluents.
W77-02087

A SUBMODEL FOR NITROGEN RELEASE FROM SEDIMENTS,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
O. S. Jacobsen, and S. E. Jorgensen.
Ecological Modelling, Vol. 1, No. 2, p 147-151, July 1975. 1 fig, 2 tab, 18 ref.

Descriptors: *Model studies, *Nitrogen, Nutrients, *Sediments, Anaerobic conditions, Aerobic conditions, Organic matter, Fertilization, Decomposing organic matter.
Identifiers: *Nitrogen release.

A submodel for the aerobic and anaerobic nitrogen release from sediment is set up. The rate of nitrogen release R is correlated to the nitrogen content by the following equations: R sub AN=84S sub N + 1.6 (anaerobic); R sub AE=58S sub N + 1.9 (aerobic); where: S sub N is mg N/ml in the sediment. The influence of temperature is included by use of an exponential expression, since the release is governed by a biochemical decomposition of organic matter. (Skogerboe-Colo St)
W77-02099

EFFECTS OF PHOSPHORUS ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF CLAYS,
West Pakistan Agricultural Univ., Lyallpur.
For primary bibliographic entry see Field 2G.
W77-02101

SULFUR FRACTIONS AND CARBON-NITROGEN-PHOSPHORUS-SULFUR RELATIONSHIPS IN SOME BRAZILIAN AND IOWA SOILS,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 2G.
W77-02102

A MIXED-DIMENSION KINEMATIC ESTUARINE MODEL,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 2L.
W77-02131

THE CIRCULATION AND SALINITY DISTRIBUTION OF THE UPPER POTOMAC ESTUARY,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 2L.
W77-02132

DISTRIBUTION OF SALINITY AND TEMPERATURE IN THE HUDSON ESTUARY,
City Univ., of New York. Inst. of Marine and Atmospheric Sciences.
For primary bibliographic entry see Field 2L.
W77-02141

OXYGEN IN A TIDAL RIVER: LOW TIDE CONCENTRATION CORRELATES LINEARLY WITH LOCATION,
North Carolina Univ. at Chapel Hill. Marine Sciences Program.
For primary bibliographic entry see Field 2L.
W77-02145

A COMPARISON OF LUMPED-PARAMETER AND DIFFUSIONAL MODELS DESCRIBING THE EFFECTS OF THE OUTLET BOUNDARY CONDITIONS ON THE MIXING IN FLOW SYSTEMS,
City Coll., New York. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2L.
W77-02147

CHARACTERIZATION OF URBAN RUNOFF,
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
W. Whipple, Jr, B. B. Berger, C. D. Gates, R. M. Ragan, and C. W. Randall.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 459, Price codes: A02 in paper copy, A01 in microfiche. Summary Report, September 1976, 21 p. OWRT C-5341 (No 4239) (5).

Descriptors: *Water quality, Water pollution, Heavy metals, Nutrients, Suspended solids, Sewers, *Urban hydrology, *Storm drains, Biochemical oxygen demand, *Urban runoff, Organic wastes, Sediments, Storm runoff.
Identifiers: Urban runoff pollution, Storm hydrograph loading, Storm event loadings, Unrecorded pollution.

A joint effort to characterize urban runoff was conducted by five universities. The project objective was to contribute to improved technology for analysis of undesirable effects of unrecorded pollution in heavily developed areas, including heavy metals, nutrients, suspended solids and BOD. Use was made of individual samples and of continuous sampling throughout storm hydrographs. Some streams and storm sewers studied had a single outlet, but larger rivers were sampled above and below the urban area, using mass balance analysis to determine the pollution entering the stream between the two points. The latter method presented considerable problems. The results confirmed previous findings that urban areas contribute substantial amounts of organic, nutrient and suspended sediment pollution, with commercial and industrial areas contributing more than residential areas. Similar findings were made for heavy metals, with concentrations of lead in urban runoff approximating those for phosphorus. A special study indicated no support for the widely used hypothesis that pollution loadings in urban runoff vary as the length of time since the previous storm. More data are contained in individual reports by the five contributing universities.
W77-02180

THERMAL PLUMES IN THE KANSAS RIVER,
Kansas Water Resources Research Inst., Manhattan.
Y. S. Yu, and S. K. Kaul.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 351, Price codes: A03 in paper copy, A01 in microfiche. Contribution No. 182, August 1976. 33 p, 8 fig, 13 tab, 5 ref, append. OWRT A-066-KAN(1). 14-31-0001-5016.

Descriptors: *Thermal properties, *Kansas, *Thermal pollution, Velocity, Themperature, Thermodine, Distribution patterns, Path of pollutants, Electric power plants.
Identifiers: *Kansas River(Kan), Shallow streams, *Thermal plumes.

A case study of the heated discharge from the Tecumseh Power Plant into the Kansas River was conducted to determine the velocity and temperature distributions in the near field of the thermal plume in a reach about 350 ft long. The stream flow was 460 cfs with an average depth about 2 to 3 ft. The heated discharge from a submerged outlet 4 ft in diameter was 40 cfs and the measured initial temperature rise after passage of condensors was 40 deg F. The results show that the presence of a relatively stagnant region immediately upstream from the heated effluent affected significantly the shape and temperature distribution in the near-field of the plume. The outer boundary of the plume extended more than 10 pipe diameters upstream from the outlet and the maximum width of spreading across the stream was 12 diameters. The temperature rise in a vertical water column was not uniform but decreased with increasing depth from the surface. No ambient water was present beneath the plume. The decay of maximum temperature rise with the longitudinal distance was slow in the region less than 10 diameters and became rapid beyong that.
W77-02187

TRANSIENT MOVEMENT OF WATER AND SOLUTES IN UNSATURATED SOIL SYSTEMS, PHASE II,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2G.
W77-02189

WATER POLLUTION INVESTIGATION: DULUTH-SUPERIOR AREA,
Midwest Research Inst., Kansas City, Mo.
A. D. McElroy, and S. Y. Chin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-239 409, Price codes: A06 in paper copy, A01 in microfiche. Environmental Protection Agency, Chicago, Illinois, Report EPA 905/9-74-014, October 1974. 99 p, 37 tab, 17 fig, 15 ref.

Descriptors: *Water pollution, *Water quality, *Model studies, *Simulation analysis, Minnesota, Wisconsin, Methodology, Waste disposal, Waste treatment, Waste water treatment, Industrial wastes, Domestic wastes, Water quality, Oxygen, *Oxygen demands, *Oxygen sag, Great Lakes, Lake Superior, Sewage treatment, River basins.
Identifiers: *Duluth-Superior Area(Minn-Wisc), *Lower St. Louis River basin(Minn-Wisc), Best practicable technology, Effluent limits, Benthic oxygen demands.

The Lower St. Louis River Basin from Brookston to Lake Superior was sampled in late 1973. The resultant data were combined with historical data for verification of a water quality model--the St. Louis River Basin Model, developed under a separate contract (EPA No. 68-01-1853). The model was used to evaluate the effect on water quality of implementing effluent limits using best practicable technology and best available technology for industrial discharges, and secondary treatment for municipal waste sources, as required by the 1972 Amendments to the Federal Water Pollution Act. The study indicates that implementation of the above effluent limits, as well as utilization of a centralized treatment plant of advanced design, will result in a significant improvement in water quality in the Lower St. Louis River. However, with current benthic oxygen demand rates, DO in the reservoirs is projected to border on noncompliance at summer low flow, even with essentially zero discharge of pollutants from industrial and municipal sources in the Cloquer area. (Katz)
W77-02202

WATER QUALITY IMPACTS OF URANIUM MINING AND MILLING ACTIVITIES IN THE GRANTS MINERAL BELT, NEW MEXICO,
Environmental Protection Agency, Dallas, Tex. Region VI.
For primary bibliographic entry see Field 5G.
W77-02208

FATE AND EFFECTS OF OIL POLLUTANTS IN EXTREMELY COLD MARINE ENVIRONMENTS,
Louisville Univ., Ky.
For primary bibliographic entry see Field 5C.
W77-02210

AN ECOSYSTEM ANALYSIS OF ENVIRONMENTAL CONTAMINATION BY LEAD,
Illinois Univ. at Urbana-Champagn. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5A.
W77-02211

EXCHANGE OF NUTRIENTS AND TRACE METALS BETWEEN MARSH SEDIMENTS AND ESTUARINE WATERS - A FIELD STUDY,
Clemson Univ., S. C. Dept. of Chemistry and Geology.
L. R. Gardner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 492, Price codes: A06 in paper copy, A01 in microfiche. South Carolina Water Resources Research Institute, Clemson, Report No. 63, September 1976. 95 p, 13 fig, 6 tab, 64 ref, 2 append. OWRT B-055-SC(5).

Descriptors: *Marshes, *Estuaries, *Silica, *Phosphorous, Alkalinity, Metals, Water quality, Simulation analysis, *South Carolina, Trace elements, Nutrients, Sediments, Estuarine environment, *Path of pollutants, Copper, Zinc, Molybtlenum, Water poilution sources.
Identifiers: *Trace metals, *Marsh sediments.

Some of the effects of marshes on the quality of adjacent coastal waters are described and some of the mechanisms of materials exchange between

marshes and estuaries are identified. Data were collected on the quantity and quality of runoff from marshes during low tide exposure and on the chemistry of interstitial waters and marsh sediments. The results indicate that marshes export phosphorous and silica in amounts comparable to the supply of these elements by terrestrial stream flow and that marshes take up Cu, Zn and Mo but at rates so low that the effect on the concentrations of these elements in coastal waters is immeasurably small. The export of silica and phosphorous from marshes is due chiefly to the diffusion of these substances from the sediment into a thin layer of water on the marsh surface that slowly drains during low tide exposure. A mathematical simulation of the process was formulated which qualitatively fits the observed pattern of silica concentration in the runoff.
W77-02217

THERMAL EFFECTS ON BIODEGRADATION OF POLLUTANTS IN WATER,
Memphis State Univ., Tenn. Dept. of Biology.
C. G. Hollis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 912, Price codes: A03 in paper copy, A01 in microfiche. Research Report No. 53, December 3, 1976. 29 p, 8 fig, 1 tab, 37 ref. OWRT A-037 TENN(1).

Descriptors: *Biodegradation, *Linear alkyl sulfonates, Water pollution, Water quality, *Thermal pollution, Water temperature, Organic compounds, Organic wastes.
Identifiers: *Linear alkyl benzenesulfonates, Trace organics.

The rate of biodegradation of linear alkyl benzenesulfonate was increased as temperature was increased from 5C to 35C in 10C increments. At 45C and 55C, the compound was not degraded. Biodegradation was enhanced by acclimatizing the sewage seed to LAS when compared to using unacclimatized seed and seed acclimatized to temperature only. Carbon chain degradation, sulfate removal and benzene ring opening of the LAS molecule were somewhat simultaneous and were influenced by incubation temperatures. The presence of glucose in the reaction mixture retarded the rate of LAS carbon chain biodegradation. The data suggest thermal pollution would increase the rate by which trace amounts of biodegradable organic compounds, such as LAS, would be degraded in water.
W77-02218

MOVEMENT OF FERTILIZER AND HERBICIDE THROUGH IRRIGATED SANDS,
Florida Univ., Gainesville. Dept. of Soil Science; and Florida Univ., Gainesville. Inst. of Food and Agriculture.
R. S. Mansell, F. M. Rhoads, L. C. Hammond, H. M. Selim, and W. B. Wheeler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 505, Price codes: A04 in paper copy, A01 in microfiche. Florida Water Resources Research Center, Gainesville, Publication No. 38, September 10, 1976. 50 p, 21 fig, 4 tab, 20 ref, append. OWRT A-026-FLA(10). 14-34-0001-6010.

Descriptors: Infiltration, Irrigation, Herbicides, Fertilizers, Kinetics, Sorption, Soils, Path of pollutants, *Sands, *Florida, Irrigated land, Leaching.
Identifiers: Trickle irrigation.

The simultaneous movement of water and selected agrichemicals (fertilizer nutrients and herbicide) through sandy soils is of particular importance to the efficient use of fertilizers and irrigation water by agricultural crops. Efficient use of fertilizers and herbicides applied to Florida's sandy soils is desirable for maintaining optimum growth of plants and for minimizing groundwater contamination. Laboratory and field experiments as well as mathematical models were used to study water and solute (potassium and phosphorus nutrients and 2,4-D herbicide) transport in two representative Florida soils: Wauchula sand and Troup sand. In an irrigated and fertilized corn experiment, grain yields and efficiency of water use were observed to be mutually related to both the irrigation and the fertilizer application treatments. Leaching of applied nutrients and irrigation water from the soil 'rooting zone' resulted in decreased water use efficiency in these soils. Mathematical models were developed and used to simulate transport and chemical-physical reactions for potassium, phosphorus and 2,4-D herbicide in these soils. Reactions such as adsorption-desorption, chemical precipitation and immobilization (fixed) greatly influenced the movement and thus potential leaching of these solutes through the soil.
W77-02219

PROCEEDINGS: 8TH ANNUAL WATER RESOURCES SEMINAR GROUNDWATER RESOURCES AND DEVELOPMENT NOVEMBER 24 AND 25, 1975.
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 4B.
W77-02223

TUBIFICIDS (OLIGOCHAETA: TUBIFICIDAE) - INDICATORS OF THE QUALITY OF WATER BODIES, (IN RUSSIAN),
Akademiya Nauk Latvilskoi SSR, Riga. Inst. of Biology.
For primary bibliographic entry see Field 5A.
W77-02225

SOME HYGIENIC PROBLEMS RELATED TO THE USE OF HERBICIDES OF THE 2,4-DICHLOROPHENOXYACETIC ACID GROUP, (IN RUSSIAN),
Tomsk Meditsinskii Institut (USSR).
For primary bibliographic entry see Field 5G.
W77-02231

NITROGEN IN THE SOIL WATER OF THE ECOSYSTEM OF THE AMAZONIAN PRAIRIES, (IN PORTUGESE),
Instituto Nacional de Pesquisas da Amazonia Manaus (Brazil).
A. Dos Santos, and M. D. G. Ribeiro.
Acta Amazonica 5(2), p 173-182, 1975.

Descriptors: *Nitrogen, *Soil water, Ecosystems, South America, Vegetation, Metabolism, Microorganisms, *Grasslands, Seasonal, Decomposing organic matter, *Biodegradation.
Identifiers: *Brazil, Prairies, *Amazonian prairies(Brazil).

The main sources of N in the soil water of the ecosystem of the Amazon campina (Brazil) are decomposing material, (litter), water running off the vegetation and the byproducts of the metabolism of microorganisms. Water samples from the watertable at 4 white sand sites (regosol) were analyzed for NH4, NO2 and NO3 and the concentration of organic N and total N were calculated. There was a greater concentration of organic N present than in that from other origins. NH4-N was the principal product of the formation of organic material by microorganisms and it had the 2nd largest concentration; NO3 and NO2 were almost always absent because of the soil acidity (pH 3.0). There are annual and seasonal variations in the N compounds. The greatest quantities were obtained in the middle of the dry season. On white sand N is not a limiting factor for the development of the natural vegetation.--Copyright 1976, Biological Abstracts, Inc.
W77-02239

ANALGOLOGICAL SURVEY OF THE SONDELEDFJORD NEAR RISOR, S. NORWAY: A 'LAND-LOCKED' FJORD EXPOSED TO POLLUTION, (IN NORWEGIAN),
Oslo Univ. (Norway). Inst. of Zoology.
J. P. Nilssen.
Blyttia 33(1), p 17-26, 1975.

Descriptors: *Fjords, *Algae, Cyanophyta, Estuaries, Sewage, *Littoral, Salinity, Temperture, Surveys, Outfall sewer, Pulp wastes, Oxygen, Chlorophyta, Path of pollutants, *Water pollution.
Identifiers: *Norway, Polysiphonia-hemisphaerica, Sills, *Analgological surveys.

The algal vegetation in the littoral zone in the Sondeledfjord near Risor, S Norway is described. A review is given of the physical and chemical condition in the fjord. The estuary is moderately brackish, having a salinity all year of approximately 20%. The temperature and salinity gradients are considerable; thus water renewal seldom occurs in the deep. The sills are numerous and between them are stagnant waters. The fjord is open at both ends; this, together with the number of sills, exposes it to further pollution. The pollutants, domestic sewage and pulp mills, mostly come from the neighboring areas. The structure of the different algal communities is dependent upon the distance from a sewer outfall. In the vicinity of an outfall the algal community was dominated by green and blue-green algae. This may be due to interspecific competition, light, O2 condition, amount of sewage, exposure, water movements, etc. Two characteristic algal profiles and the distribution of Polysiphonia hemisphaerica are given.--Copyright 1976, Biological Abstracts, Inc.
W77-02252

THE EFFECT OF BOTTOM SEDIMENTS ON FORMATION OF SURFACE WATER COMPOSITION, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
I. G. Garasevich, I. K. Palamarchuk, and B. I. Nabivanets.
Gidrobiol Zh 11(6), p 18-27, 1975.

Descriptors: *Bottom sediments, Sampling, Industrial wastes, Water pollution sources, Surface waters.
Identifiers: Biogens, *USSR, *Sugar refinery wastes.

The mechanical and chemical composition of bottom sediments was studied in 2 tributaries of the Ros. River, Kamenka and Roska (USSR). Sampling was done in sections subjected to sugar-refinery waste and in 'pure zones'. Bottom sediments influenced by sugar-refinery waste release a great number of biogens and organic substances and may be a source of surface water secondary pollution.--Copyright 1976, Biological Abstracts, Inc.
W77-02259

MEASURES FOR THE PROTECTION OF THE RIVERS ZETA AND MORACA, (IN SERBO-CROATIIAU),
Zavod za Zastitu Prirora, Titograd (Yugloslavia).
For primary bibliographic entry see Field 5G.
W77-02267

CASE OF SUBSURFACE WATER POLLUTION BY PETROLEUM PRODUCT WASTES, (IN RUSSIAN),
Meditsinskii Institut, Tselinograd (USSR).
N. I. Anan'Ev, A. A. Kyuregyan, and L. A. Rybina.
Gig Sanit 10, p 97-98, 1975.

Descriptors: *Oil pollution, *Oil wastes, *Water pollution sources, Water supply, Industrial wastes, Path of pollutants, Chemical analysis, *Pollutant identification, Subsurface waters.

Identifiers: Kazakh-Ssr, USSR, *Alekseevka(USSR).

The water supply of the city of Alekseevka (Kazakh SSR, USSR) is obtained from fissure waters of Ordovician granitoids by means of 10 wells. In Dec. 1973 petroleum products began to appear in the tap water. Petroleum wastes poured onto the soil surface and into primitive settling tanks by industrial plants were the source of pollution. These plants were located on high ground and the petroleum products penetrated along the fissures to the groundwater level. Metal tanks are presently being used for temporary waste storage. Chemical analysis revealed a decrease in the content of petroleum products in the water. Some time is required before they disappear entirely from the aquifer.--Copyright 1976, Biological Abstracts, Inc.
W77-02273

A MODEL FOR THE SIMULTANEOUS PRODUCTION AND DIFFUSION OF FERROUS IRON IN SUBMERGED SOILS,
Agricultural Univ., Wageningen (Netherlands). Dept. of Soils and Fertilizers.
For primary bibliographic entry see Field 2G.
W77-02278

FIXATION OF IRON AND ZINC APPLIED AS CHELATES INTO A SOIL COLUMN DURING LEACHING,
Hebrew Univ., Rehovoth (Israel). Dept. of Soil and Water Science.
For primary bibliographic entry see Field 2G.
W77-02280

EFFECT OF LIME ON BORON TRANSPORT TO AND UPTAKE BY COTTON,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
For primary bibliographic entry see Field 3F.
W77-02282

INTERACTIONS OF MICRONUTRIENTS IN BARLEY GROWN ON ZINC-POLLUTED SOILS,
Himachal Pradesh Univ., Palampur (India).
For primary bibliographic entry see Field 2G.
W77-02287

NITROGEN LOSSES FROM SOILS OF THE NORTH CAROLINA COASTAL PLAIN,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
R. P. Gambrell, J. W. Gilliam, and S. B. Weed.
Journal of Environmental Quality, Vol. 4, No. 3, p 317-323, 1975.

Descriptors: *Nitrogen, *Denitrification, *Nutrients, Soils, Soil investigations, Drainage, Drainage effects, Fertilizers, Fertilization, *North Carolina, Return flow, Sediments, Corn(Field), *Coastal Plains.

Nitrogen balances were measured for a moderately well-drained and a poorly drained soil in the North Carolina Coastal Plain to evaluate the effect of drainage on the fate of unutilized fertilizer N. Approximately one-half of the fertilizer N applied to each soil was not utilized by the crop. Most of the nitrogen lost by surface runoff from both soils was organic nitrogen associated with the sediment. However, there was a measurable increase in loss of nitrogen from fertilized plots as compared to unfertilized plots. The poorly drained soil (27% organic matter) had approximately 50% less surface runoff than did the moderately well-drained soil (2% organic matter). However, the concentration of N in runoff from the poorly drained soil was almost twice as great resulting in nearly identical N losses from the two soils. Much of the total surface loss of N from corn occurred during the first few months after planting. (Skogerboe-Colo St)
W77-02294

THE DISTRIBUTION OF TWO MOSQUITO-LARVIVOROUS FISHES, GAMBUSIA AFFINIS AND ORYZIAS LATIPES, IN THE TOKYO METROPOLITAN AREA, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Parasitology.
For primary bibliographic entry see Field 5G.
W77-02297

STATUS OF GROUND-WATER MODELING IN THE U.S. GEOLOGICAL SURVEY,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-02300

PREDICTED AND OBSERVED TEMPERATURE AND WATER-QUALITY CHANGES OF LAKES AND RESERVOIRS,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 2H.
W77-02304

RECONNAISSANCE OF GROUND-WATER RESOURCES OF THE SQUAXIN ISLAND INDIAN RESERVATION, WASHINGTON,
Geological Survey, Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-02308

WATER-QUALITY STUDY OF A REACH OF THE MERCED RIVER IN YOSEMITE NATIONAL PARK AND VICINITY, CALIFORNIA--APRIL 1973 THROUGH SEPTEMBER 1974,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-02309

TRANSVERSE MIXING IN NATURAL CHANNELS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-02313

EFFECTS OF WATER MANAGEMENT ON FRESH-WATER DISCHARGE TO BISCAYNE BAY,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-02314

A BIVARIATE-REGRESSION MODEL FOR ESTIMATING CHEMICAL COMPOSITION OF STREAMFLOW OR GROUNDWATER,
Geological Survey, Lakewood, Colo. Water Resources Div.
T. D. Steele.
Hydrological Sciences Bulletin, Vol 21, No 1, p 149-161, March 1976. 3 fig, 6 tab, 23 ref.

Descriptors: *Water quality, *Computer models, *Network design, Streams, Groundwater, Regression analysis, Chemical analysis, Data collections, Computer programs, Statistical methods, Data storage and retrieval.
Identifiers: *SYSLAB programs.

Regression between concentrations of major inorganic constituents and either specific conductance or streamflow discharge characterize chemical-quality conditions at a sampling site or of an area and can be used to estimate streamflow chemical-quality composition over time and in space where information is lacking or deficient. In this manner, less costly water quality network operations may be achieved for a given programme, enabling available resources to be reallocated to the collection and analysis of data where information is deficient. The SYSLAB system is a sequential set of documented special-purpose computer programs for statistically and graphically analysing historical water-quality records and deriving relevant regression relationships based upon this analysis. These computer programs have been applied under a variety of hydrological conditions to characterize regional chemical-quality patterns across the United States and in Pakistan. Case-study results using the proposed methodology are presented for Nigeria, Japan, and Pakistan. (Woodard-USGS)
W77-02317

MODELING COLIFORM-BACTERIA CONCENTRATIONS AND PH IN THE SALT-WEDGE REACH OF THE DUWAMISH RIVER ESTUARY, KING COUNTY, WASHINGTON,
Geological Survey, Tacoma, Wash. Water Resources Div.
W. L. Haushild, and E. A. Prych.
Open-file report 76-415, 1976. 43 p, 11 fig, 4 tab, 22 ref.

Descriptors: *Water quality, *Model studies, *Coliforms, *Hydrogen ion concentration, *Estuaries, *Washington, Mathematical models, Data collections, Evaluation, Equations, Salinity, Water temperature, *Bacteria, Decomposing organic matter, *Path of pollutants.
Identifiers: *Duwamish River estuary(Wash), King County(Wash).

Total- and fecal-coliform bacteria, plus pH, alkalinity, and dissolved inorganic carbon are water-quality parameters that have been added to an existing numerical model of water quality in the salt-wedge reach of the Duwamish River estuary in Washington. The coliform bacteria are modeled using a first-order decay (death) rate, which is a function of the local salinity, temperature, and daily solar radiation. The pH is computed by solving a set of chemical-equilibrium equations for carbonate-bicarbonate buffered aqueous solutions. Concentrations of total- and fecal-coliform bacteria computed by the model for the Duwamish River estuary during June-September 1971 generally agreed with observed concentrations within about 40 and 60 percent, respectively. The computed pH generally agreed with observed pH within about a 0.2 pH unit; however, for one 3-week period the computed pH was about a 0.4 unit lower than the observed pH. (Woodard-USGS)
W77-02324

MOVEMENT OF HEAVY METALS BELOW SEWAGE DISPOSAL PONDS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
L. J. Lund, A. L. Page, and C. O. Nelson.
Journal of Environmental Quality, Vol. 5, No. 3, p 330-334, July-September, 1976. 7 fig, 4 tab, 10 ref.

Descriptors: *Heavy metals, *Sewage disposal, *Sludge disposal, *Soil analysis, *Treatment facilities, Zinc, Cadmium, Copper, Chromium, Nickel, Chemical oxygen demand, Metals, Ponds, Soil chemical properties, Soil contamination effects, Soil investigations, On-site investigations, Solubility, Sewage treatment, *Path of pollutants.
Identifiers: Metal-organic complexes.

The extent of downward movement of zinc, cadmium, copper, chromium, and nickel in coarse-textured soils beneath sewage sludge and effluent disposal ponds at two sewage treatment plants was investigated. Concentrations of acid-extractable metals were greater under disposal ponds than at offplant control sites at both treatment plants. Metal enrichment was evident at depths as great as 3 m under some ponds; and zinc, cadmium, copper, chromium, and nickel levels at this depth ranged as high as 75, 10, 30, 30, and 70 micrograms/gram, respectively. The depth and degree of metal enrichment depended on the specific pond type and the treatment plant. Metal concentrations

were greater under anaerobically digested sludge-holding ponds than under effluent ponds. Concentrations of the metals in saturation extracts of soils beneath the ponds were much greater than those typically found for California soils. The distributions of the metals with depth were closely related to changes in chemical oxygen demand of soil samples with depth, suggesting that the metals were transported as soluble metal-organic complexes. (Kreager-FIRL)
W77-02379

TRACE ELEMENTS IN THE ENVIRONMENT OF SOME GOITER REGIONS OF THE TASHKENT OBLAST, (IN RUSSIAN),
Uzbekskii Nauchno-Issledovatelskii Institut Sanitarii, Gigieny i Profzabolevanii, Tashkent (USSR).
For primary bibliographic entry see Field 5G.
W77-02388

INTERACTIONS OF FERRIC AND FERROUS IRONS AND ORGANIC MATTER IN WATER ENVIRONMENT,
Tokyo Metropolitan Univ. (Japan). Dept. of Chemistry.
T. Akiyama.
Geochem J. 7(3), p 167-177, 1973.

Descriptors: *Iron, *Organic matter, *Chemical precipitation, Iron compounds, Environment, Iron oxides, Algae, Bacteria, Biodegradation, *Chlorophyta, Dissolved solids, Lipids.

Coprecipitation of organic matter with ferric and ferrous hydroxide, and Fe holding in a solution containing organic matter were experimentally studied. The dissolved organic matter from bacterial degradation of green algae was used. Ferrous Fe, as well as ferric Fe, coprecipitate organic matter under reduced conditions and ferric and ferrous irons selectively coprecipitate proteinous materials. On the contrary, pigment and lipid materials are rarely coprecipitated and hold ferric Fe in dissolved form probably by forming water soluble Fe-organic complexes. The significance of the interaction of organic matter and Fe in their cycle in the hydrosphere is shown.--Copyright 1974, Biological Abstracts, Inc.
W77-02389

THEORETICAL APPROACH TO GAS MOVEMENT THROUGH SOILS,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
C. A. Moore.
In: Symposium on Gas and Leachate from Landfills: Formation, Collection, and Treatment, March 25-26, 1975, New Brunswick, New Jersey, Department of Environmental Science, Rutgers University, p 33-43. 22 fig, 2 ref.

Descriptors: *Landfills, *Gases, *Methane, *Mathematical models, *Waste disposal, Solid wastes, Physical properties, Chemical properties, Soil physical propperties, *Path of pollutants.

A mathematical model for predicting the flow of gases around sanitary landfills is presented along with some preliminary results. The mathematical analogue decouples the physical characteristics of the gases, the porous medium, and the areal geology. Interactions between the gas and the liquid or solid phases can be incorporated into the analogue through equilibrium equations. A solution to the analogue, assuming a 70% methane level in the landfill for 5 years and no excess total pressure, yields the following information: the maximum radial extent of the 5% methane level above the elevation of the landfill base extends for 1.28-2.25 times the radius of the landfill, depending on the perviousness of the ground surface; decay to below 5% methane requires from 1 to over 150 years; decomposition times in excess of 5 years result in further excursion of the 5% methane level; as the porosity of the soil increases, the 5% methane excursion distance increases; a small degree of perviousness of the ground surface is very effective in reducing the 5% methane excursion; vents are effective in reducing methane concentrations along a radial line passing through the vent but are essentially useless in reducing methane along radial lines a few degrees away from the line through the vent; and circumferential trenching can significantly reduce methane concentrations. (See also W77-02394) (Kreager-FIRL)
W77-02401

LEACHATE ATTENUATION IN UNDISTURBED AND REMOULDED SOILS,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
G. J. Farquhar, and F. A. Rovers.
In: Symposium on Gas and Leachate from Landfills: Formation, Collection, and Treatment, March 25-26, 1975, New Brunswick, New Jersey, Department of Environmental Science, Rutgers University, p 54-70. 14 fig, 8 tab, 15 ref.

Descriptors: *Attenuation, *Leachate, *Soils, *Landfills, Analytical techniques, Solid wastes, Soil types, Soil tests, Soil water, *Path of pollutants, Waste dilution.

Soil attenuation of landfill leachate was studied by comparing the flow and contaminant removal patterns in columns containing both undisturbed and remoulded samples of the same soil. A significant degree of attenuation by dilution was provided by the water retained in the soil below the field capacity. Remoulded soils provided more attenuation by dilution than did undisturbed soils. When flow conditions were intergranular, the use of remoulded soil columns for estimating attenuation was acceptable; thus, the estimation of attenuation using dispersed soil reactors corrected for the degree of dilution appears to be acceptable. Removal isotherms constructed from dispersed soil studies can be used to predict the breakthrough curves for some contaminants. This can be accomplished for contaminants where the isotherms constructed from dispersed soil studies are linear. (See also W77-02394) (Kreager-FIRL)
W77-02403

LEACHATE MIGRATION THROUGH SELECTED CLAYS,
Illinois State Geological Society, Urbana.
R. A. Griffin, and N. F. Shimp.
In: Symposium on Gas and Leachate from Landfills: Formation, Collection, and Treatment, March 25-26, 1975, New Brunswick, New Jersey, Department of Environmental Science, Rutgers University, p 92-95.

Descriptors: *Migration, *Leachate, *Attenuation, *Landfills, *Clay minerals, *Chemical analysis, Mercury, Lead, Zinc, Cadmium, Calcium, Iron, Manganese, Chemical oxygen demand, Waste disposal, Solid wastes, Ion exchange, Ions, Metals, Montmorillonite, Kaolinite, Illite, Path of pollutants.

Leachate migration through three different clay minerals was investigated as part of an effort to evaluate the potential use of clay as a liner for landfills. Montmorillonite clay exhibited the strongest attenuatioN, being about four times more effective than illite and five times more effective than kaolinite. Mercury, lead, zinc, and cadmium were the components most strongly attenuated by the clays. Calcium, iron, and manganese showed on attenuation. Chemical oxygen demand showed a relatively low attenuation. Adsorption studies revealed that the most important factors affecting the prediction of a given metal ion's migration under a solid waste disposal site are the pH of the solution, the cation exchange capacity of the clay, and the ionic composition of the solution matrix. A computer simulation model was written to predict metal ion migration through clay columns. (See also W77-02394) (Kreager-FIRL)
W77-02406

ORGANIC POLLUTANTS CONTRIBUTED TO GROUNDWATER BY A LANDFILL,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
W. J. Dunlap, D. C. Shew, J. M. Robertson, and C. R. Toussaint.
In: Symposium on Gas and Leachate from Landfills: Formation, Collection, and Treatment, March 25-26, 1975, New Brunswick, New Jersey, Department of Environmental Science, Rutgers University, p 96-110. 7 fig, 4 tab, 21 ref.

Descriptors: *Groundwater, *Landfills, *Leachate, *Waste disposal, *Water pollution, Chemical analysis, Organic compounds, Domestic wastes, Solid wastes, Leaching, On-site investigations, *Path of pollutants.

Groundwater from a well within a landfill and from a control well was sampled using a modified low-flow carbon adsorption procedure to determine the contribution of organic compounds to groundwater resulting from the disposal of refuse. Column chromatography, solubility separation, and gas chromatography/mass spectrometry measurements revealed low levels of many undesirable organic chemicals in the groundwater which were apparently leached from the landfill. More than 40 compounds were identified, most of which were chemicals commonly employed in industry for the manufacture of domestic and commercial products. The source of these compounds was apparently manufactured products which were discarded in the landfill since it had not received appreciable wastes from industrial operations. The results demonstrated the potential for long-term pollution of groundwater as a result of solid waste disposal in landfills. (See also W77-02394) (Kreager-FIRL)
W77-02407

ATTENUATION MECHANISMS OF POLLUTANTS THROUGH SOILS,
Arizona Univ., Tucson. Coll. of Agriculture.
W. H. Fuller, and N. Korte.
In: Symposium on Gas and Leachate from Landfills: Formation, Collection, and Treatment, March 25-26, 1975, New Brunswick, New Jersey, Department of Environmental Science, Rutgers University, p 111-122. 4 fig, 7 tab, 6 ref.

Descriptors: *Attenuation, *Soil types, *Leachate, *Landfills, *Clay minerals, Chromium, Mercury, Nickel, Lead, Copper, Arsenic compounds, Beryllium, Cadmium, Zinc, Chemical analysis, Path of pollutants.
Identifiers: Vanadium, Selenium, Oxisols, Ultisols.

Soil columns were leached with a landfill leachate spiked with selected potentially hazardous elements to investigate soil attenuation mechanisms. The relative mobility of 11 trace elements in landfill leachate was ranked for 11 soils representing seven soil orders. The most generally mobile elements were chromium, mercury, and nickel; whereas the least mobile elements were lead and copper. The mobility varied with conditions for arsenic, beryllium, cadmium, selenium, vanadium, and zinc. The soil that was most effective in attenuating trace elements was Molokai, and Oxisol from Hawaii. Davidson, an Ultisol from North Carolina, ranked second in its immobilization effectiveness. Both soils are high in clay and extractable free iron oxides. The attenuation of other soils varied but generally ranked according to the amount of clay-sized particles in the soil. (See also W77-02394) (Kreager-FIRL)
W77-02408

NONPOINT-SOURCE POLLUTION IN SURFACE WATERS: ASSOCIATED PROBLEMS AND INVESTIGATIVE TECHNIQUES.
National Environmental Research Center, Las Vegas, Nev. Monitoring Applications Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 995, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-680/4-75-004, June 1975. 47 p. 2 tab, 44 ref. 22AEB/002.

Descriptors: *Water pollution sources, *Pollutant identification, *Monitoring, *Sampling, Sediments, Runoff forecasting, Pesticides, Nutrients, Forest management, Erosion, Water sampling, Testing procedures, Remote sensing, Agricultural runoff, Acid mine water, Reservoirs, Dredging, On-site data collections, Laboratory tests, Automation.
Identifiers: *Nonpoint pollution sources.

Sediment--over 50% of it cropland runoff--is the principal non-point pollutant. Other contaminants include minerals and acids, pesticides, nutrients such as phosphorus and nitrogen, natural and synthetic organic wastes, heat, pathogenic microorganisms and radioactive materials. These pollutants are caused by food and forage cultivation, animal husbandry, silviculture, mining, construction of facilities, hydrographic modifications, channelization, impoundments, mining gravel from streams and dredging. Techniques are reviewed for predicting the rate and nature of pollution loading to a given waterway from all the major nonpoint-sources. Monitoring strategies and techniques applicable to identification and assessment of nonpoint-source contaminants are analyzed and compared for their utility in state programs aimed at water quality and pollution control. Various procedures are given for manual field sampling, automated sampling, use of automated contact sensors, remote sensors and aerial reconnaisance with a matrix of parameters to be considered in field and laboratory tests for pollutants. (Harris-Wisconsin)
W77-02444

WATER HYACINTHS AND ALLIGATOR WEEDS FOR REMOVAL OF LEAD AND MERCURY FROM POLLUTED WATERS,
National Space Technology Labs., Bay St. Louis, Miss.
For primary bibliographic entry see Field 5G.
W77-02450

RARE EARTH ELEMENT SUPPLY TO THE OCEAN,
Ecole Normale Superieure, Paris (France). Laboratoire de Geologie.
For primary bibliographic entry see Field 2L.
W77-02478

SILVER CONTENT OF PRECIPITATION FROM SEEDED AND NONSEEDED FLORIDA CUMULI,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 2K.
W77-02485

MONITORING WATER QUALITY FROM LANDSAT.
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 5A.
W77-02494

WATER FOWL REFUGE EFFECT ON WATER QUALITY: I. BACTERIAL POPULATIONS,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Biology; and New Mexico Inst. of Mining and Technology, Socorro. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-02513

NUTRIENT DISTRIBUTIONS IN A SPODOSOL DURING CORN GROWTH,
Florida Univ., Gainesville. Dept. of Soil Science.
R. S. Mansell, L. W. Zelazny, L. C. Hammond, and H. M. Selim.
Soil and Crop Science Society of Florida Proceedings, Vol 34, p 24-29, December 1974. 9 fig, 2 tab, 15 ref. OWRT A-026-FLA(3). 14-31-0001-5009.

Descriptors: *Infiltration, Irrigation, Herbicides, Fertilizers, Soils, Kinetics, *Corn(Field), Growth rates, *Nutrients, Distribution, *Path of pollutants, Sorption.
Identifiers: Soil pH, Trickle irrigation, *Spodosol.

Distributions of K, P, NH4-N, and NO3-N in a tile-drained Wauchula sand (Spodosol) were determined under corn cultivation in the spring of 1974. Grain yields of 6,346 and 7,907 kg/ha were obtained from plots receiving 567 and 9,070 kg/ha of limestone, respectively. Nutrient distributions in the soil solution phase were used to describe nutrient movement with time in the soil profile. Movement of NO3-N, NH4-N, K, and Cl proceeded downward in the profile during the first 43 days. However, for times greater than 43 days downward movement of these nutrients did not exceed 50-70 cm depth. Restricted downward transport of nutrients was attributed to the presence of a slowly-permeable B'2t horizon located 75 cm from the soil surface. (Morgan-Florida)
W77-02516

BIO-REFRACTORY INDEX FOR ORGANICS IN WATER,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W77-02520

MODELING REACTIONS AND TRANSPORT OF POTASSIUM IN SOILS,
Florida Univ., Gainesville. Dept. of Soil Science.
H. M. Selim, R. S. Mansell, and L. W. Zelazny.
Soil Science, Vol. 122, No. 2, p 77-84, 1976. 10 fig, 17 ref. OWRT A-026-FLA(9). 14-34-0001-6010.

Descriptors: Infiltration, Irrigation, Herbicides, Fertilizers, Soils, Kinetics, Sorption, *Potassium, *Path of pollutants, *Mathematical models.
Identifiers: Trickle irrigation.

A mathematical model was developed to describe potassium reactions and transport in soils. Kinetic reactions were assumed to govern the transformation between solution, exchangeable, nonexchangeable (secondary minerals), and primary mineral phases of potassium. Simulated results were presented for two soils, a weakly sorbing soil and a strongly sorbing soil. The effect of kinetic rate coefficients upon transport and transformation of applied potassium was also investigated. The model is flexible and can be adapted to incorporate various transformation mechanisms between the different phases of potassium. Model validation with the aid of experimental data is needed to further describe the fate of potassium in soil. (Morgan-Florida)
W77-02529

DISTRIBUTIONS OF 2,4-D AND WATER IN SOIL DURING INFILTRATION AND REDISTRIBUTION,
Florida Univ., Gainesville. Dept. of Soil Science.
H. M. Selim, R. S. Mansell, and A. Elzeftawy.
Soil Science, Vol 121, No 3, p 176-183, 1976. 10 fig, 22 ref. OWRT A-026-FLA(7). 14-31-0001-5009.

Descriptors: *2-4-D, *Distribution, *Path of pollutants, *Infiltration, Irrigation, Herbicides, Fertilizers, Soils, Kinetics, Sorption, Mathematical models, *Pesticides.
Identifiers: Soil pH, Trickle irrigation.

A numerical model was developed to predict transient water and reactive solute transport in water-unsaturated soil. An implicit-explicit method of finite difference approximation was used to simultaneously solve the water and solute flow equations. The model was used to calculate transport of water and 2,4-D (2,4-Dichlorophenoxyacetic acid) in a field profile of Lakeland fine sand during infiltration at constant intensities (2.08 and 4.10 cm/hr). Calculated values of the soil-water distributions compared well to experimental determinations, but agreement obtained between 2,4-D distributions was only adequate. Simulated results were also obtained to study the effect of irrigation intensity on water and herbicide transport during redistribution following irrigation. It was found that for advanced stages of redistribution, solute movement became negligible and the maximum herbicide concentration was located at the same depth in the soil profile regardless of irrigation intensity. (Morgan-Florida)
W77-02542

AN EXPERIMENTAL HIGH-ASH PAPER MILL SLUDGE LANDFILL: SECOND ANNUAL REPORT,
Michigan State Univ., East Lansing. Div. of Engineering Research.
For primary bibliographic entry see Field 5E.
W77-02555

AN EXPERIMENTAL HIGH-ASH PAPER MILL SLUDGE LANDFILL: FIRST ANNUAL REPORT,
Michigan State Univ., East Lansing. Div. of Engineering Research.
For primary bibliographic entry see Field 5E.
W77-02556

INVESTIGATIONS OF EFFLUENT CHARACTERISTICS FROM CONVENTIONAL AND OXYGEN BLEACHING SEQUENCES: RESULTS OF LABORATORY STUDIES,
National Council of the Pulp and Paper Industry for Air and Stream Improvement, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 5D.
W77-02563

TOXICITY, UPTAKE AND SURVEY STUDIES OF BORON IN THE MARINE ENVIRONMENT,
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 5C.
W77-02565

5C. Effects Of Pollution

EFFECTS OF SELECTED CHEMICALS ON MOVEMENT, GROWTH AND SURVIVAL OF CERTAIN AQUATIC ANIMAL LIFE,
Kansas Univ., Lawrence. Dept. of Physiology and Cell Biology.
E. C. Bovee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 388, Price codes: A04 in paper copy, A01 in microfiche. Kansas Water Resources Research Institute, Lawrence, Completion Report, KWRRI Contribution No. 175, July 1976. 64 p, 12 fig, 13 ref, 3 append. OWRT B-040-KAN(1). 14-31-0001-5074.

Descriptors: Aquatic life, *Cadmium, *Calcium, *Cations, *Chemicals, *Chromium, *Copper, Effects, *Iron, *Lead, *Protozoa, *Toxicity, Animal growth, Heavy metals, *Aquatic animals, Water pollution effects.

Identifiers: Adenosine triphosphate, *Alleviation, Interactions, Paramecium, *Selenium, Tetrahymena pyriformis.

Since previous experiments with the protozoan, Tetrahymena pyriformis suggested that cations of heavy metals, (e.g., cadmium, in amounts of one part in 1 million parts of water) which often pollute industrial wastes act on the respiratory mechanisms which generate and store energy in the form of ademosine triphosphate (ATP), research was conducted to determine if certain substances (e.g., other metals) naturally present in freshwaters would counteract the toxic effects of the pollutants. Experiments showed calcium will offset the toxic effects of cadmium, somewhat if present in equal amounts, completely if in much greater amounts than the cadmium. Other experiments showed that iron will completely alleviate toxic effects of copper when the two are present in equal amounts (e.g., 5 to 15 parts per million of each in the water). Iron also proved to be stimulatory to growth (at those concentrations), whether or not the copper was present. Experiments were also done with movement and survival of protoza (e.g., Tetrahymena pyriformis and Paramecium caudatum). Toxic effects were found, but more data are required to determine the exact amounts of those metals which are toxic, and the discrete nature of the toxic effects.
W77-02084

IDENTIFICATION AND QUANTIFICATION OF WATER QUALITY CHANGE INDUCTING MECHANISMS IN STRATIFIED RESERVOIRS,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
J. A. Gordon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 366, Price codes: A06 in paper copy, A01 in microfiche. Research Report No. 54, October 6, 1976. 111 p, 46 fig, 22 tab, 62 ref. OWRT A-040-TENN(1). 14-31-0001-5043.

Descriptors: Reservoirs, Water quality, *Eutrophication, Nitrogen, *Dissolved oxygen, Iron, Phosphorus, *Nitrification, Bacteria, *Tennessee, Benthos, Stratification, Settling velocity, Thermocline, Muds, Anaerobic conditions, Manganese, Ammonia.
Identifiers: *Tims Ford Reservoir(Tenn), *Benthic muds.

Several mechanisms causing water quality changes in a deep stratified reservoir were identified and in many cases quantified. These mechanisms included several processes responsible for dissolved oxygen depletion, nitrogen transformations and addition of water quality constituents from the benthic muds. The mechanisms were identified from an analysis of data collected by the Tennessee Valley Authority from Tims Ford Reservoir near Winchester, Tennessee, during 1974 and 1975. Dissolved oxygen depletion occurred in three distinct depth zones and the depletion mechanisms were found to be different in each zone. A major finding was that the depletion in the area of the thermocline was related to increased concentrations of phytoplankton, bacteria and particulate organic matter in this zone. These increased concentrations were caused by a decreasing settling velocity gradient caused by rapidly decreasing temperatures in the thermocline. A model of this process was developed. The nitrogen transformation processes of nitrification, denitrification, ammonification and biological uptake were identified and assessed. Major changes of nitrogen compounds occurred during times of anaerobic conditions in the reservoir hypolimnion. Release rates of water quality constituents from the benthic muds were determined after anaerobic conditions had become established. Phosphorus, ammonia, organic nitrogen, iron and manganese were the major constituents released.
W77-02089

HYGIENIC STANDARDIZATION OF DIETHYLBENZENE IN WATER BODIES, (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
For primary bibliographic entry see Field 5G.
W77-02152

CHANGES IN BENTHOS AND FISHES OF A STREAM ACCOMPANYING A SUBSTANTIAL REDUCTION IN PLANT NUTRIENTS,
Pennsylvania State Univ., University Park. Dept. of Biology.
E. L. Cooper, and C. C. Wagner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 360, Price codes: A02 in paper copy, A01 in microfiche. Pennsylvania Institute for Research on Land and Water Resources, University Park, Completion Report, October, 1976. 17 p, 7 tab, 10 ref. OWRT A-039-PA(1). 14-31-0001-5038.

Descriptors: *Sewage effluents, Streams, *Eutrophication, *Benthos, *Fish, Brown trout, *Nutrient removal, Water pollution effects, *Pennsylvania, Water pollution control.
Identifiers: *Spray irrigation, Terrestrial ecosystems, Aquatic macrophytes, Residual chlorine, Slimy sculpins, Macrophytes, *Spring Creek(Penn).

Disposal of treated domestic sewage effluent into small streams contributes to excessive eutrophication and degradation of beneficial uses. Spring Creek has a recent history of becoming highly eutrophic. Currently, a pumping station and spray-irrigation system is nearing completion that will divert effluent and apply it to a terrestrial ecosystem. This report documents the 1975 status of aquatic macrophytes, benthos, and fishes from sections of Spring Creek, in anticipation of changes which may occur soon after effluent diversion. This before-and-after experiment, measuring changes in the biota, should document the efficacy of procedures of sewage diversion in reversing eutrophication of streams. Macrophytes increased in abundance from the upstream station above the effluent discharge to the station below the State College plant, but were completely absent from the lowest station below the new Houserville plant. Residual chlorine from the Houserville plant may cause the complete absence of plants downstream from this effluent. Conditions in 1975 continue to show marked differences between sections of Spring Creek above and below the sewage effluent discharges, compared with earlier data. Diversion of effluent from the stream should permit rapid recovery to conditions that existed before 1962 when the local sewage plant was greatly enlarged. (Sink-Pennsylvania State)
W77-02191

SYSTEM FOR EVALUATION OF THE HAZARDS OF BULK WATER TRANSPORTATION OF INDUSTRIAL CHEMICALS,
National Academy of Sciences, Washington, D.C. Committee on Hazardous Materials.
For primary bibliographic entry see Field 5G.
W77-02206

FATE AND EFFECTS OF OIL POLLUTANTS IN EXTREMELY COLD MARINE ENVIRONMENTS,
Louisville Univ., Ky.
R. M. Atlas.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-003 554, Price codes: A03 in paper copy, A01 in microfiche. Report to Office of Naval Research, 31 December 1974, 36 p., 4 tab., 4 fig., 4 ref. ONR N00014-74A-0180-0001.

Descriptors: *Oil wastes, *Oil pollution, *Degradation, *Microbial degradation, *Chemical degradation, Microbiology, *Toxicity, Bioassay, Oil spill, Photosynthesis, Respiration, Fungi, Alaska, Arctic, *Cold regions, *Environmental effects, Path of pollutants, Marine biology.
Identifiers: *Oil biodegradation, *Alaskan waters, *Prudhoe Crude oil, Marine environment.

The biodegradability of different crude oils depended on their composition and temperature, heavier oils were more resistant to biodegradation, but lighter oils, while more susceptible to degradation at warm temperatures, contained volatile components that inhibited crude oil mineralization at reduced temperatures. It was possible to stimulate degradation of Prudhoe crude oil by fertilization and microbial seeding. Success of stimulated biodegradation depended on providing sufficient nutrients for extensive microbial metabolism in an oleophilic form and on the presence of appropriate oil degrading microorganisms for the given ecosystem. Microbial degradation did not increase toxicity to invertebrates test organisms. Amphipods were only killed by direct physical contact with oil slicks. The seed Pseudomonas sp. was not pathogenic or toxic to the bioassay organisms. Petroleum was found to inhibit microbial photosynthesis and nitrogen fixation, but not respiration. Chronically polluted areas had abnormally high numbers of fungi and low numbers of bacteria. Pristine Alaskan waters all contained microorganisms capable of oil biodegradation. (Katz)
W77-02210

OCCURRENCE OF KEROSENE-LIKE HYDROCARBONS IN THE BREAM, MYLIO AUSTRALIS GUNTHER,
Queensland Dept. of Primary Industries, Hamilton (Australia). Sandy Trout Food Preservation Research Lab.
D. W. Connell, K. Cox, and R. L. McLauchlan.
Australian Journal of Marine and Freshwater Research, Vol. 26, p. 419-422, 1975, 1 tab., 1 fig., 7 ref.

Descriptors: *Water pollution effects, *Oil wastes, *Commercial fish, *Taste, *Organoleptic properties, *Gas chromatography, *Pollutant identification, *Organic compounds, Gas chromatography, Analytical techniques.
Identifiers: *Bream, Mylio australis, *Alkanes.

Samples of the bream, Mylio australis from an area approximately 4 km north of the Brisbane River mouth have been found to contain a mixture of kerosene-like hydrocarbons, probably of petroleum origin rather than generated by internal metabolic processes. Capillary column gas chromatography and gas chromatography coupled with mass spectrometry permitted the unequivocal identification of a series of n-alkanes in this mixture. The kerosene like mixture of hydrocarbons is believed to cause a taint in the flesh of the fish. (Katz)
W77-02212

EFFECT OF ENVIRONMENTAL CONDITIONS ON THE DEGRADATION OF DDT IN MODEL MARINE ECOSYSTEMS,
Cornell Univ., Ithaca, N. Y. Lab. of Soil Microbiology.
F. W. Juengst, Jr., and M. Alexander.
Marine Biology, Vol. 33, p. 1-6, 1975, 4 fig., 13 ref.

Descriptors: *DDT, *DDD, *Model studies, *Environmental effects, *Temperature, *Salinity, *Degradation(Decomposition), *Biodegradation, Ecosystems, *Metabolism, *Algae, *Sediments, Sea water, Analytical techniques, Laboratory tests, Gas chromatography.
Identifiers: *Cylindrospermum sp.

Three model ecosystem types were established, one containing seawater, another having seawater plus 3 to 5 grams sediment, and one in which 75 ml of sediment were covered with seawater sufficient to maintain a free water phase of about 5 mm.

Each bottle received 3.75 mg of DDT. No products of DDT metabolism were detected in surface seawater at temperatures of 4 deg. to 32C, at various salinities and in the presence or absence of oxygen. DDD was formed from DDT in surface waters supplemented with Cylindrospermum cells, and both DDD and DDE were produced in surface water -sediment model ecosystems receiving organic amendments. Flooded sediments were especially active in converting DDT to DDD, and an unknown compound accumulated in these sediments. None of a series of compounds known to be generated microbiologically from DDT in vitro was observed in the model ecosystems. (Katz)
W77-02213

A NEW TECHNIQUE FOR REMOTE MONITORING OF ACTIVITY OF FRESHWATER INVERTEBRATES WITH SPECIAL REFERENCE OXYGEN CONSUMPTION BY NIAIDS OF ANAX SP. AND SOMATOCHLORA SP. (ODONATA),
Environmental Protection Agency, Grosse Ile, Mich.
W. R. Swain, R. M. Wilson, R. P. Neri, and G. S. Porter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 503, Price codes: A02 in paper copy, A01 in microfiche. Mimeographed paper, Univ. of Minn. School of Medicine, Duluth, and Lake Superior Basin Studies Center, Duluth, July 1974, 17 p. OWRT B-097-MINN(3).

Descriptors: *Invertebrates, Monitoring, Remote sensing, *Respiration, *Analytical techniques, Dragonflies, Crustaceans, Pollutant identification.
Identifiers: *Oxygen consumption(Niaids), *Anax sp., *Somatochlora sp., Odonata, *Niaids.

A new technique is described for remote monitoring of aquatic invertebrate populations which was specifically designed to eliminate effects on organism behavior attendant with other surveillance systems. Specifically, the system described overcomes the necessity for surgical implantation, restrictive weight, and the generation of unnatural activity. This system was used to monitor the activities of a wide variety of aquatic invertebrates ranging in size from crustaceans, 300-600 micro long to dragonfly naiads, 3-5 cm. long. Immature Anax sp. and Somatochlora Sp. were monitored for respiratory activity in relationship to decreasing oxygen tensions. An inverse relationship was observed between respiratory frequency and amplitude of respiration. (Waelti-Minnesota)
W77-02216

THERMAL EFFECTS ON BIODEGRADATION OF POLLUTANTS IN WATER,
Memphis State Univ., Tenn. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W77-02218

EFFECTS ON THE PHOSPHOROUS SITUATION IN LAKE RADASJON ON CHANGES IN THE POLLUTION SITUATION, (IN SWEDISH),
Goteborg Univ. (Sweden). Inst. of Zoology.
L. Henrikson, H. Nyman, and H. Oscarson.
Vatten 31(4), p 398-303, 1975.

Descriptors: *Phosphorus, Lakes, Water pollution effects, Sewage disposal, Waste disposal, Oxygen demand.
Identifiers: *Lake Radasjon(Sweden), Oxygen depletion.

In Lake Radasjon, Sweden (mean depth 8.5 m; area 2.0 km2), the renewal time is 0.2 yr. In July 2972 waste water discharge from 8000-10,000 persons was eliminated from the lake by a waste tube, resulting in a rapid decrease of the total P concentration. The immediate effect of untreated waste water on the total P concentration in the lake was studied twice when the waste tube was damaged. At these times higher values than usual were found in the cove where the waste water was released. The annual total P loading in 1971 was 6.4 g/m2 per yr, in 1973 a.4 g/m2 per yr and in 1975 0.9 g/m2 per yr. This calculated value is probably too high due to deposition of P in lakes upstream of Lake Radasjon. The P loading caused by natural supply exceeds dangerous values. Large parts of the lake bottom occasionally experience O2 deficit and are a potential source of P.A control program to study the total P loading effects in a longer time perspective is being developed.--Copyright 1976, Biological Abstracts, Inc.
W77-02227

BIBLIOGRAPHY OF SOVIET LITERATURE ON FRESHWATER HYDROBIOLOGY AND RELATED PROBLEMS: 1974-1975 (ISSUE 19), (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 2I.
W77-02232

BIOLOGICAL MONITORING: SUBSTANTIATION AND EXPERIENCE IN ORGANIZATION, (IN RUSSIAN),
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 5A.
W77-02235

THE EFFECT OF CURRENT VELOCITY AND CHANGES IN WATER LEVEL ON THE COMPOSITION OF THE PLANKTONIC CILIATE POPULATION OF THE DANUBE RIVER, (IN HUNGARIAN),
M. C. Bereczyk.
Allattani Kozl 62(1-4), p 15-21, 1975.

Descriptors: *Plankton, *Protazoa, *Bacteria, Europe, Velocity, Water levels, Rivers, Water pollution effects.
Identifiers: *Danube River(Hungary), Danubialia, Holotricha, Hungarica, Hungary.

The occurrence of 157 ciliate species in the Hungarian section of the Danube river was studied from 1965-1973. Members of the order Holotricha were dominant in the number of specimens and the number of species. The predaceous and carrion-eating species were dominant earlier, but the bacteria-eating species assumed dominance in the last 3 yr, probably due to pollution. Current velocity below 2 m/s did not inhibit ciliate colonization but flooding did. During floods, the ciliate populations of inlets were only temporarily increased and the number of species and specimens diminshed on the 3rd or 4th day following a flood. The fauna characteristic of the season and the saprobiological condition was evident only when the water level reached 300 cm after a flood.--Copyright 1976, Biological Abstracts, Inc.
W77-02236

TOXICOLOGICAL CHARACTERISTICS OF ACUTE PHENOL INTOXICATION IN SOME FRESHWATER WORMS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
V. A. Alekseev, and N. E. Uspenskaya.
Gidrobiol Zh 10(4), p 48-55, 1974.

Descriptors: *Phenols, *Worms, *Toxicity, Water pollution effects, Invertebrates, *Oligochaetes, *Tubificids, Temperature.
Identifiers: Chaetogaster-diaphanus, Euplanaria-lugubris, Glossiphonia-complanta, Haemopsis-congerisuga, Helobdella-stagnalis, Herpobedlla-octoculata, Lumbriculus-variegatus, Mesostoma-ehrenbergii, Stylaris-lacustris, Tubifex-tubifex.

Worms possess a higher resistance to acute phenol intoxication than other water invertebrates, except for Turbellaria (Euplanaria lugubris, Mesostoma ehrenbergii) and small Oligochaeta (Stylaria lacustris, Chaetogater diaphanus, Lumbriculus variegatus, Tubifex tubifex) from the family Naididae. At high temperature and starvation conditions, intoxication in Oligochaeta begins earlier and proceeds more intensely. Resistance of adult and young leeches (Herpobdella octoculata, Haemopsis congerisuga, Glossiphonia complanta, Helobdella stagnalis) is almost the same and considerably exceeds that of eggs.--Copyright 1976, Biological Abstracts, Inc.
W77-02237

STUDIES ON THE TOLERANCE OF THE GUPPY, POECILIA RETICULATA (PETERS), A NATURAL ENEMY OF MOSQUITO LARVAE, TO THE SEPTIC POLLUTION OF WATER, (IN JAPANESE),
Teikyo Univ., Hachioji (Japan). Dept. of Parasitology.
T. Kurihara, M. Sasa, J. Miyamoto, and H. Sato.
Jpn J Sanit Zool 24(2), p 165-174, 1973.

Descriptors: *Toxicity, Organic matter, Microorganisms, Aeration, Larvae, *Mosquitoes, Oxidation, Water pollution effects, *Hydrogen sulfide, Ammonium.
Identifiers: *Poecila-reticulata.

The toxicity of septic waters (containing organic matter and microorganisms) to P. reticulata was highly correlated with the concentration of H2S concentration increased to>1 ppm, and remained so until the concentration dropped to <2 ppm. The pH level during this period was usually below 6, but it gradually changed to near neutral in connection with the increase of NH3 in the water. The septic water also became non-toxic to the fishes after providing aeration for a few hours. Under experimental conditions, H2S dissolved in distilled water was toxic for the fish at concentrations higher than 1 ppm, while the toxicity of NH3 in water was seen at concentrations > 11 ppm. The toxicity of H2S and NH3 was remarkably reduced by mixing the 2 solution at adequate ratios. (NH4)2S was safe for the fish even at 63 ppm, and became toxic only at 125 ppm and higher. The accumulation of H2S produced by microorganisms under anaerobic condition is probably the principal cause of the toxicity, and the subsequent increase of ammonia in water acts as a neutralizing agent. By providing aeration into the septic waters the DO (dissolved O2) concentration rapidly increased, but in most cases the concentration started to drop after several hours, probably due to reproduction of aerobic microorganisms which consume O2 for oxidizing the fouling substances.--Copyright 1976, Biological Abstracts, Inc.
W77-02238

EFFECT OF MINE WASTEWATERS ON THE WATER QUALITY OF THE OL'KHOVOYE RESERVOIR, (IN RUSSIAN),
I. M. Soboleva, V. L. Sinitsin, A. S. Pel'Tikhin, and A. G. Veselyi.
Gidrobiol Zh 11(4), p 101-104, 1975.

Descriptors: Mine wastes, Mine water, Acid mine water, Bacteria, Reservoirs, Water quality, Water pollution effects, Chlorides, Sulfates, Sodium.
Identifiers: *Olkovaye Reservoir(USSR), Titer, Ukrainian-SSR, USSR.

The wastewaters of 42 mines flow into the Ol'khovoye River, on which the Ol'khovoye reservoir is located, in the Donetsk Oblast, Ukrainian SSR (USSR). The chemical composition of the mine waters is characterized by high mineralization and high content of chlorides, sulfates and NA+. To improve the water quality of the reservoir, the mine wastewaters should be treated in settling ponds or at local mine-treatment plants, the tributary channels should be cleaned, water-protection belts and zones should be organized, atierosion measures should be implemented and fresh water should be released from the North

Donets-Donbas canal. Analysis of bacterial heterotroph content and coli-titer indicated an intensive self-purification process in the reservoir.--Copyright 1976, Biological Abstracts, Inc.
W77-02242

HYGIENIC ASPECTS OF A STUDY OF BDELLOVIBRIO BACTERIOVORUS AS A NATURAL FACTOR OF SELF-PURIFICATION OF WATER BODIES, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR).
G. I. Sidorenko, G. A. Bagdasar'Yan, Y. G. Talaeva, R. M. Abieva, and Z. S. Verklova.
Vestn Akad Med Nauk Sssr 3, p 52-58, 1975.

Descriptors: *Self purification, *Bacteria, *Enteric bacteria, Public health, Microorganisms, Water pollution, *Viruses, Salmonella, Shigella, Coliforms, Microorganisms, Pathogenic bacteria.
Identifiers: Adenoviruses, Bacilli, Bacterio, *Bdellovibrio-bacteriovorus, DNA, Guinea-pig, Hela, Kidney, Mammals, Monkey, Mouse, Phages, Picornaviruses, Rabbit, RNA, Salmonella-typhosa, Shigella-sonnei, Typhoid, Vibrio-eltor, Viruses, *Black Sea, *Caspian Sea.

Since 1969, wastewaters, surface waters and subsurface waters of the temperate climatic zone and the Black and Caspian Seas were examined for the presence of B. bacteriovorus. Presence of pathogenic Entero-bacteriaceae, sanitary-indicator microorganisms, enteroviruses and phages of dysentery, typhoid and coli bacilli was determined. The cytopathic effects of 7 strains of B. bacteriovorus were studied in monkey kidney and HeLa tissue cultures, white mice, rabbits and guinea pigs. The strains proved nontoxic and nonvirulent in LD50 doses to 1 billion. Salmonella typhosa and Shigella sonnei isolated from humans and exposed to B. bacteriovorus lost the ability to form colonies on solid media. B. bacteriovorus showed lytic activity with respect to strains of El Tor vibrios and a pronounced virus-inactivating effect with respect to RNA viruses (enteroviruses) and DNA viruses (adenoviruses). The correlation found between the content of B. bacteriovorus and pathogenic microorganisms in fresh and sea waters indicates that it can be used as an indicator of water pollution by pathogenic microflora. The nonpathogenicity of B. bacteriovorus for mammals and the broad spectrum of its lytic activity indicate its possible importance in self-purification of polluted water, primarily at local treatment plants, particularly for hospital wastewater.--Copyright 1976, Biological Abstracts, Inc.
W77-02243

FACTORS DETERMINING ASPECTS OF FISH PARASITOFAUNA FORMATION IN THE KAKHOVKA RESERVOIR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Zoologii.
M. P. Iskov.
Gidrobiol Zh 11(4), p 69-74, 1975.

Descriptors: *Fish parasites, Reservoirs, Rivers, *Water pollution, Water temperature, Copepods, Isopods, Trematodes, Nematodes.
Identifiers: Cestoda, Cnidosporida, *Dnieper River(USSR), *Kakhovka Reservoir(USSR), USSR.

Fish parasitofauna in the Lower Dnieper before its improvement was compared with that in the Kakhovka reservoir (USSR). The main factors influencing the species composition and degree of parasitic infestation of fish are changes in the species composition and number of hydrobionts due to an increase in depth, redistribution of shallow zones, water pollution, silting of the water body floor, retardation of current velocity and higher water temperatures. Species of Cnidosporidea, Trematoda, Cestoda, Nematoda, Isopoda and Copepoda are mentioned.--Copyright 1976, Biological Abstracts, Inc.
W77-02246

DEVELOPMENT OF THE CHLOROCOCCAL ALGA COELASTRUM MICROPORUM NAEG. IN FISH-BREEDING PONDS, (IN RUSSIAN),
Vsesrossiiskii Nauchno-Issledovatelskii Institut, Prudovogo Rybnogo Khozyaistva, Moscow (USSR).
Z. I. Tsirul'Skaya.
Gidrobiol Zh 11(4), p 87-88, 1975.

Descriptors: *Algae, *Carp, *Fish diseases, Fish stocking, Fish hatcheries.
Identifiers: *Chlorococcal alga, *Coelastrum-microporum.

The timing of the mass development of the chlorococcal alga C. microporum to periods of a summer gill disease of carp of an unknown etiology and the capacity of this species for successful existence when the development of other algal species is largely inhibited can be useful for the timely forecasting and prevention of this disease.--Copyright 1976, Biological Abstracts, Inc.
W77-02248

INFLUENCE OF MERCURY, LEAD, CADMIUM AND COPPER ON PRIMARY PRODUCTION AND PHYTOPLANKTON IN SOME COASTAL AREAS OF THE MEDITERRANEAN AND RED SEAS, (IN RUSSIAN),
A. M. Ibragim, and S. A. Patin.
Okeanologiya 15(5), p 886-890, 1975.

Descriptors: *Cadmium, *Copper, *Lead, *Mercury, Light, *Phytoplankton, *Primary productivity, Coasts, Oceans, Temperature, Water pollution effects, Metals.
Identifiers: Coscinodiscus-granii, *Mediterranean Sea, Nitschia-closterium, Rhizosolenia-alata, *Red Sea.

Series of short- and long-term experiments were made to evaluate the effect of Hg, Cu, Cd and Pb upon the production and specific composition of the coastal phytoplankton in the Mediterranean and the Red Seas at in situ temperatures and light conditions (The initial composition of the phytocenosis was mainly Nitschia closterium, Coscinodiscus granii, Rhizosolenia alota.). The experiments showed a possibility of an essential change of photosynthetic rate and specific composition of phytoplankton natural communities under the action of the concentration of metals close to the natural level in the seawater. N. closterium was most stable to the effect of metals.--Copyright 1976, Biological Abstracts, Inc.
W77-02249

SOME ASPECTS OF THE CHEMICAL COMPOSITION OF TRAPA NATANS L. IN LAKE MAGGIORE (ITALY), ESPECIALLY MANGANESE AND IRON, (IN FRENCH),
European Atomic Energy Community, Ispra (Italy).
R. Gommes, and H. Muntau.
Bull Soc R Bot Belg 108(2), p 209-218, 1975.

Descriptors: Lakes, *Manganese, *Iron, Europe, Chemical wastes, Sediments, Leaves, Roots, Water pollution effects.
Identifiers: Albumin, *Italy, *Trapa-natans, Trapa-natans-ssp-verbanensis, *Lake Maggiore(Italy).

T. natans L. ssp. verbanensis (De Not.) Schintz was collected from 1 of its 6 stations in S Lake Maggiore and analyzed for Ca, Mg, Mn, Fe, Na, K and SiO2. This plant is able to accumulate Mn and Fe in its pinnate roots (Mn, 1.36%, Fe, 3.51%). The lowest concentrations were measured in the albumen (Mn, 12 ppm; Fe, 87 ppm). The Fe/Mn ratio progressively decreases from 2.6 in the roots to 0.5 in the leaves where Mn is selectively accumulated. In the water and sediment from Trapa stations, the Fe/Mn ratio was higher than in other stations in Lake Maggiore; the absolute Mn concentrations are only slightly higher than the mean of the lake. Trapa is able to accumulate Mn, but the Trapa-Mn geobotanical association reported in Russian literature is not confirmed. The higher Mn and, especially, Fe concentrations may be due to the decomposing Trapa itself.--Copyright 1976, Biological Abstracts, Inc.
W77-02250

EFFECT OF EXOGENOUS AMINO ACIDS ON PRODUCTIVITY OF CERTAIN HIGHER HYDROPHYTES, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
N. N. Smirnova.
Gidrobiol Zh 11(4), p 47-53, 1975.

Descriptors: *Amino acids, Aquatic plants, Self purification, *Productivity, Organic compounds, Pondweeds.
Identifiers: Exogenous amino acids, Phragmites-communis, Potamogeton-perfoliatus, Spirodela-polyrrhiza.

Experiments performed to elucidate the effect of different concentrations of exogenic amino acids (alanine, glutamic acid and tryptophan) on higher hydrophytes (Phragmites communis Trin.) showed that hydrophyte productivity depends on the chemical nature of the amino acid, its concentration and the biological peculiarities of the plant. Spirodela polyrrhiza and P. communis endured higher concentrations of exogenous amino acids than Potamogeton perfoliatus. This indicates that the 2 former species have a more important role in the self-purification of bodies of water of organic components, including amino acids.--Copyright 1976, Biological Abstracts, Inc.
W77-02251

PRODUCTION OF PHYTOPLANKTON OF LAKE BAIKAL IN THE REGION OF LISTVENNICHNOYE VILLAGE, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
V. V. Bul'On.
Dokl Akad Nauk Sssr Ser Biol 223(3), p 737-740, 1975.

Descriptors: *Phytoplankton, *Chlorophyll, Lakes, Asia, *Photosynthesis, Carbon, Water temperature.
Identifiers: Listvennichnoye, USSR, Lake Baikal(USSR), Carbon assimilation.

Phytoplankton in the southern part of Lake Baikal, near Listvenichnoye village (USSR), is distinguished by exceptionally weak photosynthetic activity. The average rate of assimilation of C was only 5 mg C/1 mg chlorophyll day at an average chlorophyll content of 1 microgram/1. Photosynthesis occurred at a maximum rate at a water temperature of about 9C.--Copyright 1976, Biological Abstracts, Inc.
W77-02253

CHEMICAL COMPOSITION OF BLUE-GREEN ALGAE IN THE KREMENCHUG RESERVOIR, (IN RUSSIAN),
Tekhnologicheskii Institut Pishchevoi i Kholodilnoi Promyshlennosti, Odessa (USSR).
V. A. Peskov, I. V. Areshidze, and M. S. Dudkin.
Gidrobiol Zh 11(4), p 93-95, 1975.

Descriptors: *Cyanophyta, *Algae, Reservoir, Carbohydrates, Hydrolysis, Europe, Sampling.
Identifiers: *Anabaena-affinis, *Aphanizomenon-flos-aquae, *Kremenchug Reservoir(USSR), *Microcystis-aeruginosa, *Microcystis-Wesenbergii, Reservoir, *Saccharides, Ukrainian-Ssr, USSR.

The chemical composition of blue-green algae collected in the Kremenchug reservoir on the Dnieper River (Ukrainian SSR, USSR) in July-Aug. 1971-1972 was investigated. The 6 samples contained

varying percentages of Microcystis aeruginosa, Aphanizomenon flostaquae, Microcystis wesenbergii, Anabaena affinis (other species in the samples ranged from 1-10%). The samples contained comparatively small content of carbohydrates (14.3-23.6% of dry matter). The polysaccharides were readily hydrolyzed and consisted of galactose, glucose, arabinose, mannose, xylose, ribose, rhamnose, glucuronic acid and other monosaccharides (the 1st 5 comprised 81-83% of the total sugar in the hydrolysate).--Copyright 1976, Biological Abstracts, Inc.
W77-02254

GROWTH FACTORS ON OYSTER AND WATER POLLUTION IN SOUTH COASTAL AREA IN KOREA, (IN KOREAN),
Yonsei Univ., Seoul (Republic of Korea). Inst. of Environment Pollution Research.
M. K. Chynung, S. K. Chun, K. I. Yu, and S. P. Kwon.
J Natl Acad Sci Repub Korea Nat Sci Ser 13, p 319-340. 1974.

Descriptors: *Growth stages, *Growth rates, *Oysters, Asia, Coasts, Water pollution effects, *Animal parasites, *Mortality, Plankton.
Identifiers: Bucephalus-sp, Cestoda, Flagellata, *South Korea.

To investigate the factors affecting the growth of oysters, rainfall, water quality, plankton distribution and numbers of parasites (e.g. Flagellata, Bucephalus sp., Cestoda) were measured from July-Dec. 1973. This study of growth factors revealed a high mortality rate among the oysters from Sept.-Oct.--Copyright 1976, Biological Abstracts, Inc.
W77-02257

THE EFFECT OF BOTTOM SEDIMENTS ON FORMATION OF SURFACE WATER COMPOSITION, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5B.
W77-02259

ELEMENTS OF LIMNOLOGICAL SPECIFICITY OF LARGE LAKES IN THE TEMPERATE ZONE, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Institut Ozerovedeniya.
For primary bibliographic entry see Field 2H.
W77-02260

EFFECT OF RIVER POLLUTION ON AQUATIC BEETLES, (IN RUSSIAN),
Rostov-na-Donu Research Inst. of Neurocybernetics (USSR).
For primary bibliographic entry see Field 5A.
W77-02261

MAXIMUM ALLOWABLE CONCENTRATION OF LEAD IN SURFACE WATERS, (IN RUSSIAN),
Sverdlovsk Research Inst. of Industrial Hygiene and Occupational Disease (USSR).
M. S. Sadilova, K. P. Selyankina, E. A. Borzunova, and L. N. El'Nichnykh.
Gig Sanit 5, p 101-102, 1975.

Descriptors: *Lead, Surface water, Water supply, Lethal limit, Rodents, Water pollution effects, Water quality standards, Toxicity, Inhibition.

To refine the maximum allowable concentration (MAC) of Pb in water, chronic sanitary-toxicological experiments were performed on albino rats which received daily for 7 mo. an oral Pb dose of 0.005 mg/kg, which corresponded to its MAC in water (0.1 mg/l). This Pb dose led to a statistically significant increase of Pb content in bone, brain and liver. During the prolonged intake of Pb at the MAC for water the functional state of the CNS was disturbed. The blood pyruvic acid concentration increased, which confirmed the inhibiting effect of Pb on the activity of enzymes of carbohydrate metabolism, especially carboxylase. The adopted MAC of Pb in water is possibly too high and should be reduced from 0.1 to 0.05 mg/l.--Copyright 1976, Biological Abstracts, Inc.
W77-02262

DYNAMICS OF THE CONTENT OF SOME ORGANIC TOXIC SUBSTANCES IN PLANTS IRRIGATED WITH EFFLUENTS OF THE COAL-TAR CHEMICAL INDUSTRY, (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
L. R. Polishchuk.
Gig Sanit 4, p 117-119, 1975.

Descriptors: *Industrial wastes, Water reuse, *Toxicity, *Organic wastes, *Chemical wastes, Coal tar coatings, Irrigation, Potatoes, Corn(Field), Effluents, Soils.
Identifiers: *Coal-tar chemical wastes.

To study the migration of individual toxic ingredients of effluents of coal-tar chemical factories (mono- and polyatomic phenols, pyridine, naphthalene, benzene) from soil into plants, the presence of these substances was determined in potatoes and corn grown on experimental plots irrigated with the effluents in various concentrations. The dynamics of the accumulation and breakdown of these substances were established. Plants and soils are both powerful means of detoxification of certain organic compounds.--Copyright 1976, Biological Abstracts, Inc.
W77-02263

THE INFLUENCE OF WASTE WATERS ON ALGAE IN THE OPEN COLLECTOR OF ZAGREB AT IVANJA RIJEKA, (IN CROATIAN),
Zagreb Univ. (Yugoslavia). Institut za Biologijo.
M. Tomec, Z. Pavletic, and I. Munjko.
Acta Botanica Croatica, 34, p 53-62, 1975.

Descriptors: *Algae, Water pollution effects, Aeration, Industrial wastes, Municipal wastes, Organic loading, Activated sludge, *Waste water treatment.
Identifiers: Ivanja, Rijeka, *Zagreb(Yugoslavia), Ivanja Rijeka(Yugoslavia).

The water from the main collector the city of Zagreb, Yugoslavia, is loaded with industrial and municipal wastes. To protect underground and surface waters in that region, these waters should not be allowed to flow into the Sava River without being purified. In addition to the great organic and inorganic load of the collector waters, 70 spp. of algae were found, which probably originated in brook-waters of Zagrebacka gora. A smaller number of algae (5-15) are otherwise relatively frequent in the collector water. The number of algae found in the water after the reception of waste waters was considerably decreased. The microflora in the collector water was very active in the waste organic matter mineralization process, especially in summer, and are used in activated sludge aeration and dephenolization treatment. A reliable test is needed for establishing harmful effects of industrial waste waters on algae and other organisms in receiving waters.--Copyright 1976, Biological Abstracts, Inc.
W77-02268

THE EFFECT OF WATER WITH DIFFERENT MINERALIZATION LEVELS ON THE ANIMAL BODY, (IN RUSSIAN),
Meditsinskii Institut, Kiev (USSR).
R. D. Gabovich, and N. F. Uzhva.
Gig Sanit 10, p 25-29, 1975.

Descriptors: *Mineralogy, *Aging(Biological), *Metabolism, Potable water, Rodents, *Salts.

Water of different mineralization levels (40-2000 mg/l) had a pronounced effect on the metabolism and distribution of the investigated microelements in various organs. The most unfavorable shifts were noted in animals (rats) drinking water with a high salt content (2000 mg/l). In these animals physiological aging processes were accelerated.--Copyright 1976, Biological Abstracts, Inc.
W77-02270

SURVEYING AMERICA'S LAKES.
Environmental Science and Technology, Vol. 10, No. 9, p 862-864, September, 1976.

Descriptors: *Lakes, *Eutrophication, *Surveys, *Nutrients, *Phosphorus, Surface waters, Minnesota, *United States, Lime, Chemical precipitation, Waste water treatment, Municipal wastes, Treatment facilities, Tertiary treatment, Efficiencies, Evaluation, Algae, Algal control, *Water pollution treatment.

Preliminary results from a eutrophication survey of America's lakes are reported along with an example of how some lakes may be restored to higher quality. According to the National Eutrophication Survey, approximately 80% of the lakes and reservoirs in the eastern United States are eutrophic. Shagawa Lake, adjacent to the city of Ely, Minnesota, is an example of a eutrophic lake that has been partially restored by the removal of the algal growth-promoting nutrient phosphorus. The lake originally became eutrophic as a result of the city of Ely discharging its municipal waste water into it. The installation of a tertiary treatment system at the city's waste water treatment plant resulted in more than 99% removal of phosphorus from the effluent and a decline in eutrophic activity of Shagawa Lake. The effluent flowing into the lake contains only 0.05 milligrams/liter of phosphorus. Although the lake is in the process of repairing itself, it has not yet reached equilibrium, probably because of feedback mechanisms involving internal sources of phosphorus which may be retarding the restoration process. However, the project has demonstrated that phosphorus levels as low as 0.05 milligrams/liter can be achieved through lime precipitation. (Kreager-FIRL)
W77-02375

SOYBEAN YIELD RESPONSES AND ASSIMILATION OF ZN AND CD FROM SEWAGE SLUDGE-AMENDED SOIL,
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
T. D. Hinesly, R. L. Jones, J. J. Tyler, and E. L. Ziegler.
Journal Water Pollution Control Federation, Vol. 48, No. 9, p 2137-2152, September, 1976. 5 fig, 5 tab, 13 ref.

Descriptors: *Sewage sludge, *Soil amendments, *Heavy metals, *Crop response, *Waste disposal, Phytotoxicity, Crops, *Zinc, *Cadmium, Phosphorus, Irrigation, Symbiosis, Sludge disposal, Municipal wastes.

A 6-year study of the effects of irrigating soybean plots with municipal sludge was performed. Applications of digested sludge significantly increased soil levels of zinc and cadium which were reflected by increased concentrations of these metals in plant tissues. However, there were no indications that the absorption and translocation of relatively large amounts of these metals into leaves, petioles, and seeds had caused a phytotoxic condition. Only large amounts of phosphorus as a constituent of sludge caused a yield depression during one growing season, and the phosphorus-induced phytotoxic conditions were rapidly dissipated after sludge applications were suspended. During the following growing season, soybean yields were significantly higher on maximum sludge-treated plots than on fertile control plots. Accumulative applications of sludge affected zinc and cadmium concentrations

in soybean tissues to a lesser extent than did a particular annual application rate. Thus, if phytotoxic conditions develop as a result of zinc and cadmium accumulation in soils amended with sludge over several years, they are expected to occur during the time of sludge application rather than after the applications have been terminated as suggested by other investigators. (Kreager-FIRL)
W77-02377

THE EFFECT OF SUB-LETHAL LEAD CONCENTRATIONS ON THE CHEMORECEPTORS OF TWO FRESH WATER FISH SPECIES, (IN GERMAN),
Stuttgart Univ. (West Germany). Institut fuer Siedlungswasserbau und Wasserguetewirtschaft.
G. Haider.
Hydrobiologia 47(2), p 291-300, 1975.

Descriptors: *Lead, *Catfish, Lethal limit, Freshwater fish, Water pollution effects.
Identifiers: Ameiurus-nebulosus, Histology, Sublethal concentrations, Tinca-tinca, *Tench, *Chemoreceptors(Fish), *Lead acetate.

Sublethal concentrations of lead acetate damage the chemoreceptors of the common catfish (Ameiurus nebulosus) and the tench (Tinca tinca). Histological examinations reveal erosion of the terminal buds.
W77-02383

EFFECT OF POLYVINYL CHLORIDE ON WATER MICROFLORA, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
V. O. Sheftel', Z. S. Tsam, and I. D. Bliznyuk.
Gig Sanit 4, p 99-100, 1975.

Descriptors: Water pollution effects, Pipes, *Plastic pipes, Algae, Bacteria, *Cyanophyta, *Enteric bacteria, Iron, Rotifer, Fungi, *Iron bacteria, Flora.
Identifiers: Infusoria, *Polyvinyl chloride.

Well stabilized polyvinyl chloride water pipes do not release low-molecular weight compounds into water and do not stimulate the development of water microflora (enteric bacteria, blue-green algae, Fe-bacteria, Inufusoria, fungi, rotifers).--Copyright 1976, Biological Abstracts, Inc.
W77-02386

INTERACTIONS OF FERRIC AND FERROUS IRONS AND ORGANIC MATTER IN WATER ENVIRONMENT,
Tokyo Metropolitan Univ. (Japan). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W77-02389

CROP RESPONSE TO TANK TRUCK APPLICATION OF LIQUID SLUDGE,
Ball State Univ., Muncie, Ind. Dept. of Natural Resources.
K. A. Kelling, L. M. Walsh, and A. E. Peterson.
Journal Water Pollution Control Federation, Vol. 48, No. 9, p 2190-2197, September, 1976. 3 tab, 22 ref.

Descriptors: *Sludge, *Soil amendments, *Crop response, *Sludge disposal, *Fertilizers, Nitrogen, Phosphorus, Waste disposal, Symbiosis, Liquid wastes, Plant growth.

The effects of repeated tank truck applications of liquid sludge on experimental plots of alfalfa, corn, and sorghum-sudan were investigated. Sludge applications of 5 cm usually provided yields of corn and sorghum-sudan which were equivalent to those obtained with a moderately high rate of commercial fertilizer when these crops were planted in the growing season following sludge application. Sludge applications of up to 15 cm did not reduce crop yields and in fact generally resulted in maximum yields and nitrogen uptake. Substantial residual benefits from sludge were observed at sludge applications as low as 5 cm for sorghum-sudan and 10 cm for corn, whereas no such residual response was observed when commercial fertilizer was applied. Repeated tank truck traffic on established alfalfa plots severely reduced crown survival and subsequent yields, and liquid sludge application by this method is not recommended for such plots. Nitrogen and phosphorus recoveries by corn and sorghum-sudan were relatively low in sludge-treated plots. (Kreager-FIRL)
W77-02390

SOLID WASTE DEGRADATION DUE TO SHREDDING AND SLUDGE ADDITION,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5E.
W77-02412

CASE HISTORY OF LANDFILL GAS MOVEMENT THROUGH SOILS,
Cook Coll., New Brnswick, N. J.
For primary bibliographic entry see Field 5E.
W77-02413

ZOOPLANKTON OF THE REGION OF NOSY-BE: VI. PTEROPODS, HETEROPODS: I. HOLONERITIC AND INTERNAL-NERITIC SPECIES; CONTRIBUTION TO THE STUDY OF A TROPICAL EUTROPHIC BAY, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Nosy-Be (Madagascar). Centre Oceanographique (ORSTOM) de Nosy-Be.
S. Frontier.
CAH O R S T O M SER OCEANOGR 11(3), p 273-289, 1973.

Descriptors: *Zooplankton, *Bays, *Eutrophication, Water pollution effects, Predators, Phytoplankton, Tropical regions, Morphology, Seasonal.
Identifiers: Atlanta-Gaudichaudi, Creseis-Acicula, Creseis-Chierchiae, Heteropods, Malagasy-Republic, *Nosy-Be, Pneumopdermopsis-Sp, Pteropods.

Pneumopdermopsis sp. a predator of Creseis acicula can only be found very near the coast and shows an annual cycle parrallel to its prey. C. chierchiae shows, on the average, an abundance decrease from the coast to the continental slope, but its annual cycle differs widely from that of C. acicula. The decrease during the dry season, which is less and less marked from the slope toward the bays, reveals only the back flow of the internal neritic water towards the coast at this time of the year. In the bays the abundance reaches its maximum in the dry season. The species is composed of 2 forms which are probably phenotypic: one with a thin ribbed shell, which is strictly internal neritic, and the other with a smooth thick shell which is external neritic. Some specimens which are morphologically intermediate can be found in small quantities when the 2 settlements meet. Atlanta gaudichaudi is found on the whole continental shelf as well as in the waters of the open sea. The young forms appear to be neritic showing an abundance maximum in the set season, when the phytoplankton and the phytophagic zooplankton are abundant. The adults may feed on bigger prey and show less selective distribution.--Copyright 1976, Biological Abstracts, Inc.
W77-02416

DETRITAL UTILIZATION BY THE POLYCHAETE, CAPITELLA CAPITATA,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
K. R. Tenore.
Journal of Marine Research, Vol. 33, No. 3, p. 261-274, 1975. 4 fig., 4 tab., 39 ref. NSF GA-39911.

Descriptors: *Annelids, *Detritus, *Decomposing organic matter, *Food chains, Radioisotopes, Tracers, Particle size, Coasts, Estuaries, Marine animals, Energy budget, Laboratory tests.
Identifiers: *Polychaetes, *Capitella capitata, Eel grass, Zostera marina, Carbon-14.

Little quantitative data is available on rates of utilization of organic detritus, an important energy source in marine ecosystems, by deposit feeders, in part because of the difficulty of using isotope tracer techniques due to the release and recycling of such labels as carbon-14. This study investigated the effect of initial particle size and aging of detrital eel grass on net incorporation by the polychaete, Capitella capitata, using controls to account for isotope tracer errors due to leaching of carbon-14. Results showed an increase in the rate of incorporation with increasing detritus age for all particle sizes. For the first two periods of aging (0 and 11 days) there was a greater incorporation of the finest size detritus while the later periods revealed a greater incorporation of larger size detritus. Decay experiments with detritus showed an initial rapid decrease then a slower rate of increase in nitrogen content and corresponding changes in C:N ratios. Observed differences illustrate the need for considering the qualitative state of detritus used in growth experiments. In addition, the long decay time associated with seagrasses versus shorter decay periods of detritus from other sources would prolong the availability of the detrital food resource by expanding the temporal period of utilization of the total detrital pool. (Luedtke-Wisconsin)
W77-02435

ALGAL METABOLITE INFLUENCE ON BLOOM SEQUENCE IN EUTROPHIED FRESHWATER PONDS,
Haskins Labs., Inc., New Haven, Conn. Orsborn Memorial Lab.
K. I. Keating.
Report No. EPA-600/3-76-081, July 1976. 155 p. 26 fig., 14 tab., 144 ref. RA 801387.

Descriptors: *Inhibition, *Cyanophyta, *Diatoms, *Plant growth regulators, *Plant growth substances, *Algal control, *Succession, Zooplankton, *Connecticut, *Eutrophication, Silica, Water pollution effects.
Identifiers: Linsley Pond(Conn).

Biological sequence control of algal blooms is suggested as a relatively-inexpensive method of water quality management in moderately-sized eutrophic lakes as a practical alternative and/or adjunct to nutrient removal. Monitoring of bloom sequence in Linsley Pond, Connecticut for three years, accompanied by laboratory studies showed that certain extracellular metabolites in blue-green algae substantially inhibit the growth of planktonic diatoms in cultures and in the pond's natural sequence. A hypothetical sequence control strategy is offered, with a projected cost of about $500 per year for a pond similar to the study site. Using the strategy, winter blue-green blooms would be eliminated by copper sulfate and spring diatom growth enhanced by the addition of silica. The silica would enhance the diatom growth and some other desirable forms and would lessen the effect of the remaining blue-green metabolite inhibition. Such efforts should then increase the period of diatom domination, decrease nutrient levels left in the epilimnion when the diatoms senesce, and decrease the subsequent late summer blue-green bloom. Details are given of the in situ and of the laboratory tests. (Harris-Wisconsin)
W77-02438

OZONE AND VASCULAR TISSUE DIFFERENTIATION IN PLANTS,
Howard Univ., Washington, D.C. Dept. of Botany.
J. P. Rier.
Report No. EPA-600/3-76-068, May 1976. 32 p. 4 fig., 35 ref. 1A1006/1HA323. R-801209.

Descriptors: *Ozone, *Vascular tissues, Oxidation, Oxygen, Plant morphology, Xylem, Plant physiology, Phloem, Cellulose, Lignins, Enzymes, Proteins, Plant growth regulators.
Identifiers: *Xylem regeneration, *Indoleacetic acid, *Dichlorophenoxyacetic acid, Callus tissues, Plant internodes, Coleus blumei(Benth).

Vascular tissues of Coleus blumei (Benth) show alterations in both quantity and quality upon exposure to ozone, the heavy oxygen that is a common constituent of airborne pollution. Laboratory tests of xylem regeneration around wounded plant internodes showed that ozone-induced xylogenesis is reduced more in internodes grown in indoleacetic acid (IAA) than in dichlorophenoxyacetic acid. As a corollary, the substitution of the latter for IAA in media where sucrose also is present has a mitigating effect on the action of ozone in the xylem regeneration process. Preliminary findings also suggest that ozone has an influence on the protein and enzyme patterns in callus tissues exposed to the pollutant. The results support a supposition that plant internodes and callus tissues can both be used to study ozone effects on certain plant growth and development processes, including: (1) phloem differentiation; (2) cellulose and lignin production; (3) plant membrane integrity; (4) quantity and quality of proteins and enzymes in growing and differentiating plant tissues; and (5) the effectiveness of growth regulators in the presence of ozone. (Harris-Wisconsin)
W77-02439

PHOSPHATE REDUCTION AND RESPONSE OF PLANKTON POPULATIONS IN KOOTENAY LAKE,
Washington State Univ., Pullman.
R. A. Parker.
Report No. EPA-600/3-76-063, May 1976. 70 p. 29 fig., 5 tab., 40 ref., append. R-800430.

Descriptors: *Nutrient removal, *Phosphates, *Lakes, *Biological communities, Zooplankton, Phytoplankton, *Canada, Dams, Nitrogen, Diatoms, Daphnia, Cyanophyta, Simulation analysis, Columbia River, Hydrodynamics, Water temperature, Secchi disks, *Montana.
Identifiers: *Phosphate load reduction, *Lake Kootenay(British Columbia), Kootenay River(British Columbia), Libby Dam(Mont).

Although only a 10-15% decrease in chlorophyll-a levels were found in Kootenay Lake, British Columbia, after the soluble inorganic phosphate entering the lake was reduced 90%, important changes were recorded in the species composition of the phytoplankton population, with diatoms playing an increasingly important role relative to blue green algae. However, these changes may have been partially affected also by the completion in 1972 of the Libby Dam in Montana, upstream from the lake on the Columbia River system. Kootenay, a large and oligotrophic lake, received significant quantities of inorganic phosphate by way of the Kootenay River for 13 years prior to 1969. Post-phosphate reduction measurements were made in 1971-75, analyzing temperature, transparency, inorganic and organic phosphate, nitrate, ammonium, chlorophyll-a, copepods and cladocerans. The measurements were compared with results from limnological studies that were made of Kootenay before 1969, which emphasized nutrient levels, plankton densities, phytoplankton composition and associated parameters. Other results show that one genus of zooplankton, Daphnia, has virtually disappeared although total zooplankton levels have not changed. Primary production changed from nitrogen-limited in 1969 to phosphate-limited in 1971. A model was developed from the 1966-69 data when the phosphate input was high to predict the consequences of reduced phosphate input. (Harris-Wisconsin)
W77-02440

NITRATE REMOVAL FROM WATER AT THE WATER-MUD INTERFACE IN WETLANDS,
Louisiana Agricultural Experiment Station, Baton Rouge.
For primary bibliographic entry see Field 5G.
W77-02441

STUDIES ON LAKE RESTORATION BY PHOSPHORUS INACTIVATION,
Corvallis Environmental Research Lab., Oregon.
For primary bibliographic entry see Field 5G.
W77-02442

MATHEMATICAL MODELING OF PHYTOPLANKTON IN LAKE ONTARIO. PART 2. SIMULATIONS USING LAKE 1 MODEL,
Manhattan Coll., Bronx, N. Y. Environmental Engineering and Science Program.
R. V. Thomann, R. P. Winfield, D. M. Di Toro, and D. J. O'Connor.
Report No. EPA-600/3-76-065, August 1976. 96 p. 17 fig., 11 tab., 15 ref. R-800610.

Descriptors: *Simulation analysis, *Lake Ontario, *Phytoplankton, *Nutrients, Model studies, Mathematical studies, Mathematical models, Biomass, Productivity, Chlorophyll, Phosphorus, Nitrogen, Optimization, Probability, Great Lakes.
Identifiers: US-Canada Water Quality Agreement.

Simulations of the response of the open lake region of Lake Ontario to various levels of nutrient input, using a model developed in an earlier part of the study, tend to indicate that maximum point-source nutrient control for that part of the lake will be only a holding action and not a significant improvement in water quality parameters, because of projected difficulties in achieving measurable reductions below present levels of phytoplankton biomass beyond the near-shore zone. Simulations used a simplified dynamic model of phytoplankton-nutrient interactions in a vertically-segmented structure and assumed a horizontally well-mixed lake. Simulations assumed four different load conditions of phosphorus input as against two assumed loadings of nitrogen input. Results indicate that if the present input nutrient load is continued, spring peak phytoplankton chlorophyll level in the epilimnion will continue to increase to a new level about 45% higher than the present one. By comparison, a retrospective simulation with pastoral load estimates shows that spring phytoplankton levels were some 40% less than at present, prior to the onset of man's intensive activity level around the lake. (See also W76-11286 and W75-07700) (Harris-Wisconsin)
W77-02443

BIOLOGY OF BLUE-GREEN ALGAE OF TIDE MARSHES,
Delaware Univ., Lewes. Coll. of Marine Studies.
G. F. Somers.
Available from the National Technical Information Service, Springfield, VA 22161 as COM-75-11091, Price codes: A04 in paper copy, A01 in microfiche. Report No. DEL-SG-14-75, 1975. 64 p. 8 fig., 16 tab., 37 ref. OSG 2-35223.

Descriptors: *Tidal marshes, *Cyanophyta, Calcium, Brackish water, Plant ecology, *Delaware, Estuarine environment, Ions, Water pollution effects, Eutrophication.
Identifiers: *Calcium ion binding, Calcium cycling, St. Jones Marsh(Del), Canary Creek Marsh(Del), Cape Henlopen(Del), Big Nose Island(Del).

Dead cells of blue-green algae from laboratory cultures as well as those harvested from a tidal marsh, have a substantial capacity to bind calcium ions--a capacity in algae from a natural habitat exceeding that of the cell walls of rhizomes of Spartina alterniflora with which it might be in competition. At least in brackish waters these algae cells retain a substantial portion of the calcium ions and this is readily exchanged with the ambient medium. Algal cells could then contribute to calcium cycling by exchange reactions, with moribund or dead cells serving as a temporary reservoir of this cation. No quantitative measurement was made of this potential, but a qualitative assessment based on visual estimation of mass and seasonal abundance suggests that the blue-green algae may well contribute to the calcium cycling of a tidal marsh by uptake during periods of rapid growth and of release during their demise. Total mass of the algae may be insufficient, however, to contribute substantially to the calcium needs of the marsh environment. There is a possibility that a similar role in calcium ion binding may be played by other algae that are abundant during the seasons when blue-green algae are not conspicuous. (Harris-Wisconsin)
W77-02446

ANALYSIS OF POLLUTION FROM MARINE ENGINES AND EFFECTS ON THE ENVIRONMENT. SUMMARY REPORT.
Boating Industry Associations, Chicago, Ill.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-242 177, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-670/2-75-064, June 1975. 69 p. 7 fig., 10 tab., 15 ref. 1BB038. R-801799.

Descriptors: *Water pollution effects, *Boats, Biota, Fish, Oil pollution, Carbon dioxide, Carbon, Aquatic plants, Photosynthesis, Lead, Fuels, Gasoline, Aromatic compounds, Michigan, Florida.
Identifiers: *Outboard motor emissions, Carbon monoxide, Hydrocarbon, Ann Arbor(Mich), Gainesville(Fla).

Outboard motor emissions were not found to significantly affect aquatic ecosystems, in a study in which four ponds were subjected to use by outboard marine engines calculated to be three times greater than the level extant with saturation boating. Certain marginal changes in lake biota were found but it was not certain whether these resulted from natural effects or from the stress created by the engines. In a laboratory phase of the study conducted by the departments of Civil and Mechanical Engineering of the University of Michigan, carbon monoxide at near-saturation levels did not kill fish. Aromatic compounds such as toluene have an evaporation half-life of 11 days in a lake or other water body, assuming quiescence and uniform distribution to an initial depth of one meter. However, there is uncertainty concerning the build-up of lead in bottom sediments as a result of outboard engine operation using leaded fuel and the effect of carbon dioxide in carbon-limited lakes. Phytoplankton carbon fixation appeared to be reduced and differences were noted in the production of biomass and chlorophyll-a. (Harris-Wisconsin)
W77-02449

NUTRITIONAL ECOLOGY OF NUISANCE AQUATIC PLANTS,
Wisconsin Univ., Madison. Dept. of Botany.
G. C. Gerloff.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 263, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-660/3-75-027, June 1975. 86 p. 17 fig., 24 tab., 38 ref. 21AJF/005, R-800504.

Descriptors: *Analytical techniques, *Bioassay, *Nutrients, *Nutrient requirements, *Aquatic plants, *Aquatic algae, Anabaena, Competition, Absorption, Plant growth, Nitrogen, Phosphorus, Potassium, Copper, Testing procedures, Trace elements, Limiting factors, Wisconsin.
Identifiers: Plant analysis, Myriophyllum spicatum, Ceratophyllum demersum, Elodea occidentalis, Draparnaldia plumosa, Lemna minor, Stigeoclonium tenue, Microcystis aeruginosa.

A method for determining the trophic level and growth-limiting nutrients of waters by plant analysis is proposed. The detailed technique indicated that potassium, rather than nitrogen or phosphorus, becomes the limiting factor for the growth of the macrophytes Myriophyllum spicatum and Ceratophyllum demersum in a shallow eutrophic Wisconsin lake. Plant analysis data also indicate that critical concentrations of an element--the minimum or slightly less than the minimum concentration which will permit maximum plant yield and growth--can vary considerably among different organisms, to the extent that similar critical values cannot be generally applied even within a single taxonomic group. A technique developed for comparing aggressiveness and competitiveness among organisms in nutrient uptake is suggested for further testing, particularly among major nuisance plants. More tests are also suggested for measuring the possibility that inorganic nutrients other than nitrogen and phosphorus can be critical in nuisance plant growth. Suggested procedures are: (1) Measuring competition among several organisms in the same culture for a growth-limiting amount of a specific nutrient; (2) measuring nutrient replacement in cultures to establish the border-line concentration at which an organism failed to achieve maximum growth regardless of the adequacy of the nutrient supply; and (3) measurement of rates of nutrient uptake. (Harris-Wisconsin)
W77-02451

SOME EFFECTS OF THE ASWAN HIGH DAM ON WATER AND FISHES OF LAKE BORULLUS, A. R. E.,
Academy of Scientific Research and Technology, Cairo (Egypt).
H. M. El-Sedfy, and J. Libosvarsky.
Zool Listy. 23(1), p 61-70, 1974.

Descriptors: *Lakes, Africa, *Nutrients, Fish, Fish reproduction, Fishing, Tilapia, Water pollution effects, *Water quality.
Identifiers: *Aswan Dam(Egypt), *Lake Borullus(Egypt).

The scanty data assembled on the inflow of fresh water into Lake Borullus throw some light on the developments occurring in the Nile delta lakes after the new High Dam at Asswan was erected. In contrast to the past when huge amounts of flood water poured into the lake during 2-5 months of the year, the lake now obtains drainage and, to some extent, also Nile water more or less regularly throughout the year. As a result the water level as well as the water chlorinity are more balanced, which, presumably together with the lower input of fish and nutrients of Nile origin, have a bearing on the fish fauna and fish production in the lake. The landing statistics for 9 yr (1962-1970) show, commencing form the peak year 1966, a gradual decrease in fish production and a shift in favor of Tilapia species. The overfishing the lake has been exposed to may play an important role in this respect.--Copyright 1975, Biological Abstracts, Inc.
W77-02512

WATER FOWL REFUGE EFFECT ON WATER QUALITY: I. BACTERIAL POPULATIONS,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Biology; and New Mexico Inst. of Mining and Technology, Socorro. Dept. of Chemistry.
J. A. Brierley, D. K. Brandvold, and C. J. Popp.
Journal Water Pollution Control Federation Vol. 47, No. 7, p 1892-1900, July 1975. 4 fig, 4 tab, 9 ref. OWRT A-038-NMEX(4).

Descriptors: *Waterfowl, Aquatic bacteria, Sediment load, Water quality, Water pollution sources, *Bacteria, *Rio Grande River, Nutrients, Migrating birds, Aquatic life, Canada goose, Snow goose, Ducks(Wild), Sandhill cranes, Coliforms, *New Mexico, Running water.
Identifiers: Bosque del Apache National Wildlife Refuge(N Mex), Enterococci, Heterotrophic bacteria.

The Bosque del Apache National Wildlife Refuge is located on the Rio Grande about 12 miles (19.32 km) south of Socorro, New Mexico. The largest bird populations occur from late October to early March; average figures are 10,500 sandhill cranes, 2,000 canada geese, 8,300 snow geese and 26,500 ducks. The channel water of the Rio Grande which flows through the refuge has a high concentration of suspended sediment, heterotrophic bacteria, and coliforms. The bacterial concentration seems to correlate directly with the high sediment concentrations. The presence of a large number of birds apparently did not affect the concentrations of total heterotrophic bacteria, coliform counted at incubation temperatures of 35 and 44.5C, and enterococci. The draining of the principal pond did not seem to affect significantly the bacterial population in the recieving channel water. The pond had a decrease in number of bacteria during and following its period of maximum use. There was little apparent change in the quality of the water used by the refuge as evaluated by quantitative determination of heterotrophic bacteria, coliforms, and enterococci. (Hain-New Mexico State)
W77-02513

SEASONAL VARIATIONS OF TEMPERATURE AND NUTRIENTS IN THE SURFACE WATERS OF LAKES ONTARIO AND ERIE,
Eidgenoessische Anstalt fuer Wasservorsorgung, Abwasserreinigung und Gewaesserschutz, Kastienbaum (Switerzerland). Hydrobiology Lab.
R. Gachter, R. A. Vollenweider, and W. A. Glooschenko.
J Fish Res Board Can. 31(3), p 275-290, 1974.

Descriptors: Seasonal, *Lake Ontario, *Lake Erie, *Water temperature, *Nutrients, Surface waters, Great Lakes, Canada, Primary productivity.

During 1970, temperature and nutrient distributions were measured in surface waters of lakes Ontario (12 cruises) and Erie (10 cruises) (USA, Canada). Nutrient patterns are compared and discussed in relation to temperature, primary production and nutrient sources. In Lake Erie, due to the early onset of the phytoplankton spring bloom, nutrient concentration started to decrease much earlier than in Lake Ontario. During spring, patterns of nutrients, chlorophyll a and primary production were influenced by the thermal bar in Lake Ontario. In Lake Erie the nutrient supply controlled such patterns. In Lake Erie inorganic nutrients were depleted lake-wide in summer; in Lake Ontario, nutrients were highest in regions where upwelling occurred or inputs were high. Due to the earlier onset of fall overturn in Lake Erie, the nutrient concentration started to increase earlier in the fall than in Lake Ontario.--Copyright 1974, Biological Abstracts, Inc.
W77-02515

THE EUTROPHICATION IMPLICATIONS OF INTERACTIONS BETWEEN NATURALLY OCCURRING PARTICULATES AND METHANE OXIDIZING BACTERIA,
Ohio State Univ., Columbus. Dept. of Microbiology.
T. L. Weaver, and P. R. Dugan.
Water Research, Vol. 6, p. 817-828, 1972. 10 fig, 1 tab, 8 ref. OWRT A-027-OHIO(4).

Descriptors: *Eutrophication, *Methane bacteria, Clay minerals, Oxidation, Aquatic microbiology, Algae, Chromatography, Pollutant identification, Cycling nutrients, Lake Erie, Ecosystems.
Identifiers: *Methane oxidation, *Methane fixation, Methane carbon recycling.

The oxidation of methane by bacteria is shown to be markedly affected by various particulate materials. Several clay minerals enhanced methane oxidation while some non-clay inorganic particulates nearly completely inhibited it. Insoluble organic compounds tested were degraded in the cultures and did not function as particles. Algal cells observed as living organic particulates inhibited methane oxidation with various degrees of intensity. Suggestions are given for several particulate management practices to partially control eutrophication. (Chao-Ohio St)
W77-02536

THE EFFECT OF SELENITE ON THE PHYSIOLOGICAL AND MORPHOLOGICAL PROPERTIES OF THE BLUE-GREEN ALGA PHORMIDIUM LURIDUM VAR. OLIVACEA,
Medical Coll. of Ohio at Toledo. Dept. of Microbiology.
M. Sielicki, and J. C. Burnham.
Journal of Phycology, Vol. 9, No. 4, p 509-514, 1973. 6 fig, 16 ref. OWRT A-025-OHIO(3).

Descriptors: *Cyanophyta, Algae, Algal control, Chlorphyll, Photosynthesis, Systematics, Proteins.
Identifiers: *Selenite, *Phormidium luridum, Sodium selenite.

Phormidium luridum cultures were treated with sodium selenite in concentrations ranging from 10-6M to 10-2M. In contrast to the increasing culture turbidity of control and 10-6M selenite cultures, the turbidity of the other selenite cultures declined in proportion to time and selenite concentration. Chlorophyll extraction revealed similar results. Photosynthetic activity was inhibited within 6 hr in all cultures except control and 10-6M selenite. Phormidium at concentrations greater than 10-6M selenite showed a gradual loss of the bright green color and turned semitransparent. Cell-associated granules of reduced selenium were observed at higher selenite concentrations. Other structural changes observed were the presence of intracellular and intercellular spaces, spheroplast formation, and gradual cell lysis. Protein analyses of total cell samples and supernatant fractions confirmed cellular breakdown of selenite-treated algal cells.
W77-02546

SURVEY OF MACROINVERTEBRATE COMMUNITIES IN THE PROVO RIVER AND DIAMOND FORK SYSTEMS,
Brigham Young Univ., Provo, Utah. Center for Health and Environmental Studies.
R. N. Winget, and M. K. Reichert.
Final report, 36 p., 4 fig, 11 tab.

Descriptors: *Benthos, Stream improvement, *Water quality, Habitats, Surveys, *Utah, *Invertebrates, Pre-impoundment.
Identifiers: Provo River(Utah), Diamond Fork River(Utah), Central Utah Project, Critical aquatic habitat.

Several proposed features of the Bonneville Unit of the Central Utah Project (cup) would have significant impacts on the aquatic resources of the Provo River and Diamond Fork Systems. In order to prepare an adequate environmental impact statement an understanding of existing conditions was needed. This study was to provide characteristics of the macroinvertebrate communities of the major segments of the streams in these two systems. These data are to provide a partial basis of habitat evaluations and future management alternatives in relation to water resource development under the CUP. Both systems had segments capable of supporting quality cold water fisheries; segments of marginal quality requiring improved management practices before a fisheries could be sustained; and segments which should be designated as primarily water transport systems and not listed as part of the fisheries habitat

resource for this area. The macroinvertebrate communities reflected the environmental characteristics of each of these segment types.
W77-02548

ENVIRONMENTAL ASPECTS OF CHEMICAL USE IN PRINTING OPERATIONS, (SEPTEMBER 22-24, 1975, KING OF PRUSSIA, PA.), CONFERENCE PROCEEDINGS.
Environmental Protection Agency, Washington, D. C. Office of Toxic Substances.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 406, Price codes: A20 in paper copy, A01 in microfiche. Report EPA-560/1-75-005, January, 1976. 465 p.

Descriptors: *Chemical wastes, Conferences, *Public health, Recycling, Water pollution control, Water pollution sources, Environmental effects, Wastes, Industrial wastes, Chemical industry.
Identifiers: *Printing industry.

Papers presented at the conference are reproduced. They cover printing processes and current usage of chemicals in the printing industry; health or environmental impact of chemicals used; waste recovery and recycling;; and environmental impact of new printing processes and chemicals. (Witt-IPC)
W77-02553

TOXICITY, UPTAKE AND SURVEY STUDIES OF BORON IN THE MARINE ENVIRONMENT,
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
J. A. J. Thompson, J. C. Davis, and R. E. Drew.
Water Research, Vol. 10, No. 10, p 869-875, 1976.

Descriptors: *Pulp wastes, *Water pollution effects, *Toxicity, *Boron, *Marine animals, Aquatic animals, Sodium compounds, Salmon, Lethal limit, Sockeye salmon, Oysters, Canada, Foreign countries, Wastes, Industrial wastes, Water pollution sources, Freshwater, Sea water, Bioassay, Effluents, Pacific Coast Region, Fish physiology, Fish behavior, Fish, Pulp and paper industry.
Identifiers: Sodium metaborate, Coho salmon(Onchorhynchus kisutch), Crassostrea gigas, Groundwood mills, Boron compounds, Borates.

Little is known about the toxic and bioaccumulative dangers to aquatic life posed by borate discharge recently initiated by coastal British Columbia groundwood pulp mills. Bioassays with sodium metaborate and underyearling coho salmon (Onchorhynchus kisutch) in fresh water yielded a 283-hr LC(50) of 113 micrograms/ml (95% confidence limits of 104 and 123 micrograms/ml boron). Toxicity to coho salmon in sea water appeared considerably greater with a 283-hr LC(50) of 12.2 micrograms/ml (95% confidence limits of 10.89 and 14.56 micrograms/ml boron). The disparity between fresh and saltwater boron toxicity to coho is not understood. In salmonids, boron enters the tissues slowly, necessitating prolonged bioassay tests. Sockeye salmon (O. nerka) and juvenile oysters (Crassostrea gigas) exposed to sublethal doses of boron take up boron roughly in relation to its availability. Oysters show no bioaccumulative potential or prolonged retention of boron following cessation of dosage. Field surveys conducted before and after industrial borate emission confirm the lack of evidence for tissue bioaccumulation. Results of a survey of boron levels in receiving waters are reported. No hazard to salmonids or oysters at the present level of industrial discharge of boron (less than 1 microgram boron/ml) is apparent from this work. (Witt-IPC)
W77-02565

PROGRESS IN SUBLETHAL EFFECT STUDIES WITH KRAFT PULP MILL EFFLUENT AND SALMONIDS,
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
J. C. Davis.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 9, p 2031-2035, September, 1976. 33 ref, 2 tab.

Descriptors: *Pulp wastes, *Water pollution effects, *Salmonids, Bleaching wastes, Wastes, Industrial wastes, Water pollution sources, Water pollution, Fish, Growth rates, Fish behavior, Metabolism, Respiration, Circulation, Temperature, Resistance, Energy, *Lethal limit, Fish physiology, Toxicity, Effluents, Pulp and paper industry, Taste, Color, Organoleptic properties.
Identifiers: Kraft mills, *Sublethal effects.

Literature values of incipient sublethal response threshold concentrations for salmonids to effluent from neutralized whole bleached kraft mills, kraft bleaching, and the production of unbleached pulp are summarized. Sublethal responses included effects on growth, behavior, energetics, metabolism, respiration, circulation, and temperature tolerance in a variety of salmonids. The average incipient threshold concentration for all species surveyed was 0.16 of the 96-hr LC(50) and ranged from 0.006 to 0.33 96-hr LC(50) for neutralized whole bleached kraft mill effluent. Large differences in sensitivity were not evident between salmonid species or the three effluent types surveyed. On the basis of this analysis, it is suggested that some sublethal effects for neutralized whole bleached kraft mill effluent wil be present at a discharge dilution of 0.1 96-hr LC(50), few at 0.05 96-hr LC(50), and only rarely at 0.02 96-hr LC(50). However, at a dilution of 0.02 of the 96-hr LC(50), flesh tainting or color effects on the food chain may remain. These criteria are considered tentative and subject to revision with new knowledge and do not necessarily ensure protection of aquatic communities or sensitive food-chain organisms. Future research needs and suggestions for criteria implementation are discussed. (Witt-IPC)
W77-02573

5D. Waste Treatment Processes

A BIOASSAY TO ASSESS WASTEWATER TOXICITY TO AEROBIC BIOLOGICAL TREATMENT,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
K. J. Williamson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 394, Price codes: A03 in paper copy, A01 in microfiche. Oregon Water Resources Research Institute, Corvallis, Completion Report WRRI-49, September 1976. 43 p, 8 fig, 2 tab, 33 ref. OWRT A-036-ORE(1).

Descriptors: *Toxicity, *Bioassay, *Biological treatment, *Waste water treatment, *Aerobic treatment, Zinc, Phenols, Freeze drying, Activated sludge, Nitrites, Bioindicators, Pollutant identification, Heavy metals.
Identifiers: Nitrobacter, Trichlorophenol.

The objective was to develop a bioassay for wastewater toxicity that could be used at sewage treatment plants. Nitrobacter was used as the test organism due to the simplicity of quantifying substrate removal rates by measuring nitrite removal, a sensitivity for most toxicants greater than that of heterotrophic organisms, and a slow growth rate which enables the use of batch-fed tests. A method was developed for preserving the Nitrobacter organisms by freeze-drying. Substrate removal rates were measured for both freeze-dried and non-freeze-dried Nitrobacter in the presence of a heavy metal and an orgaic toxicant. Zinc and 2,4,5-trichlorophenol exhibited toxic effects to the Nitrobacter at concentrations comparable to those toxic to activated sludge.
W77-02081

A STUDY OF THE PHYSICOCHEMICAL PARAMETERS AFFECTING THE REMOVAL OF COLLOIDAL PARTICLES FROM WATER BY POROUS MEDIA,
Maine Univ., Orono. Dept. of Civil Engineering.
M. M. Ghosh.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 392, Price codes: A03 in paper copy, A01 in microfiche. Maine Land and Water Resources Institute, Orono, Completion Report, April 1976. 34 p, 5 fig, 4 tab, 14 ref. OWRT A-023-ME(2).

Descriptors: *Filtration, Polymers, *Zeta potential, *Diffusion, Effluents, *Colloids, *Waste water treatment, *Porous media, Model studies, Dispersion, Sewage effluents, Interception, Sands.
Identifiers: *Colloid Filtration, Polymer-coated sands, Brownian diffusion, London forces.

A conceptual model has been developed for the depth filtration of water and wastewater using granular beds considering the effect of gravity, interception, hydrodynamic forces, London attraction and Brownian diffusion for systems with negligible double layer forces. The ultimate capture of particles in a packed bed is determined not only by the transport mechanisms but also by the short-range surface forces which may play a dominant role in their attachment to media grains. The experimental data obtained for the filtration of latex monodispersions and secondary effluents using a polymercoated sand bed were in good agreement with the predictive model during initial periods of filtration when the volume of deposited material was insignificant.
W77-02086

SEPTIC TANK EFFLUENT MOVEMENT THROUGH SOIL,
Maine Univ. at Orono. Dept. of Soil Chemistry.
For primary bibliographic entry see Field 5B.
W77-02087

UTILIZATION OF NUTRIENTS FROM WASTEWATER BY WHEAT,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
D. J. Larsen.
Master of Science thesis, 1976. 62 p, 3 fig, 23 tab, 32 ref.

Descriptors: *Municipal wastes, *Water reuse, *Impaired water use, *Wheat, *Irrigation practices, *Water supply, Water resources development, Water allocation(Policy), Water conservation, Crop production, Plant growth, Fertilizers, Soil-Water-Plant Relationships, Nutrients, Irrigation, Loam, Sands, Denitrification, Waste treatment, Soil types, Ureas.

During 1973 through 1974, the city of Tucson, Arizona, reported discharges of wastewater daily. These wastewaters contain large quantities of essential plant nutrients, particularly nitrogen, phosphorus, and potassium. Research was conducted to evaluate wastewater as a source of plant nutrients and its effect upon the plants. A second objective was to evaluate the effect of wastewater application on soil chemical characteristics. Wheat plants were grown on three textures of native Gila series soils using several wastewater, wastewater-well water, and fertilizer treatments. Various physical and chemical plant parameters were measured. The results were inconclusive in providing a true measure of increased yield or chemical composition of wheat straw due to wastewater applications. Chemical analysis of the soils, after two consecutive crops of wheat grown to maturity in

each treatment, revealed several good indicators of wastewateroinduced chemical changes. Electrical conductivity and sodium phosphorus content of the soils were shown to be good measures of soil chemical changes resulting from wastewater applications. (Jamail-Arizona)
W77-02112

AQUEOUS HALOGEN EQUILIBRIA, CASE I. HALOGEN IN PURE WATER,
Army Medical Bioengineering Research and Development Lab., Fort Detrick, Md.
D. H. Rosenblatt, E. P. Meier, and M. J. Small.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-020 667, Price codes: A03 in paper copy, A01 in microfiche. Technical Report 7506, 49 p, November 1975. 4 tab, 13 ref, 2 append.

Descriptors: *Chlorine, *Halogens, *Bromine, *Iodine, *Hydrolysis, Chlorination, Chemical reactions, Water purification, Water treatment, *Disinfection, Water quality, Chemistry, Chemical degradation, Mathematical studies, Equilibrium, Aqueous solutions, Equations, *Waste water treatment, Computer programs, Pollutant identification.
Identifiers: *Chlorine hydrolysis, *Bromine hydrolysis, *Iodine hydrolysis, *Halogen species, Aqueous halogen equilibria, Equilibrium constants, Chlorine solutions, Disinfectants.

A 'master equation' was derived for the exact determination of the concentrations of halogen species formed when elemental chlorine, bromine, or iodine have been added to a water containing no interacting substances. The solutions to this equation apply only to equilibrium conditions and are only as exact as the equilibrium constants used in the calculations. Simplified lower order equations were also derived for such determinations where known boundary conditions exist. Logic diagrams were presented for the solution of the 'master equation' with the aid of a computer or a programmable calculator. A program was presented for solving the 'master equation' on the Hewlett-Packard 9830A Calculator. (Henley-ISWS)
W77-02150

WATER SUPPLY AND SEWAGE TREATMENT IN ARID AREAS.
Water Services, Vol. 80, No. 960, p 79-80, February, 1976.

Descriptors: *Water supply, *Sewage treatment, *Arid lands, *Sewage disposal, Potable water, Environmental effects, Sewage, *Treatment facilities, Waste water(Pollution), Water pollution, Water pollution sources, Water quality, Deserts, Desalination, Water treatment, Sludge disposal, Water reuse, Impaired water use, Waste water disposal, Solar.
Identifiers: Distillation.

Water supply and sewage treatment facilities in arid areas such as the Middle East, where potable water is scarce, present a variety of problems. Water demand, water supply and water quality in the Middle East are discussed and evaluated, and sewage treatment and its water requirements are investigated. Various methods of water resource development are presented including the drilling of deep bore holes to provide access to underground waters and the collecting of water in shallow concrete pans. Saline wells and seawater represent other possible water sources, and methods for their treatment such as desalination and solar distillation are evaluated. Sewage disposal and water reuse for agriculture are also discussed. It is concluded that there is need for education concerning public health, especially in areas where good water systems are a recent innovation. (Jamail-Arizona)
W77-02173

THE DESIGN AND TEST OF A SAFE AND EFFECTIVE STORM-SEWER INLET,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 8B.
W77-02186

DEVELOPMENT OF DESIGN AND OPERATING CRITERIA FOR HANDLING ADVANCED WASTE TREATMENT PLANT SLUDGE,
Missouri Univ., Rolla. Dept. of Civil Engineering.
J. C. Huang, and K. C. Tsai.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 347, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, August 1976. 30 p, 14 fig, 5 tab, 2 ref. OWRT A-074-MO(1). 14-31-0001-5025 and 6026.

Descriptors: Biological treatment, Dewatering, Sludge digestion, *Aerobic digestion, *Design criteria, *Sewage sludge, *Sludge treatment, Lime, *Waste water treatment, Water pollution control, Operations, Performance.
Identifiers: *Sewage lime sludge.

The purpose was to develop a set of criteria applicable for the design and operation of an aerobic digester treating sewage lime sludge generated from advanced waste treatment plants. Major parameters included: (1) detention time; (2) degree of sludge stabilization in terms of volatile solid destruction and COD reduction; (3) sludge dewaterability; (4) fate of precipitated phosphorus; (5) destruction of coliforms; and (6) effect of temperature on the sludge stabilization. Data of this study have indicated that sewage lime sludge is treatable by biological means. A maximum extent of stabilization is achieved within 5 days of digestion, as opposed to 15 days normally used for regular aerobic digesters. Improvement of sludge dewaterability has been significant, with similar efficiencies for a detention time ranging from 1.5 to 10 days; beyond that, a slight decrease of dewaterability has occured. Destruction of coliforms is not good even with a detention time as long as 20 days. Maintenance of a proper DO level in the digester is essential to prevent the release of phosphorus from the sludge phase into the aqueous solution. The treatment efficiencies at 20 and 30C are not much different while that at 10C is considerably lower. Based on the above findings, a new set of design criteria has been proposed for handling the sewage lime sludge.
W77-02188

REMOVAL OF VIRUSES FROM WATER BY MAGNETIC FILTRATION,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
G. Bitton, G. E. Gifford, and O. C. Pancorbo.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-261 494, Price codes; A05 in paper copy, A01 in microfiche. Florida Water Resources Research Center, Gainesville, Publication No. 40, October 1976. 75 p, 9 fig, 21 tab, 84 ref, append. OWRT A-030-FLA(3), 14-31-0001-5009, 14-34-0001-6010.

Descriptors: *Filtration, *Waste water treatment, *Viruses, *Bacteriophage, Separation techniques, *Adsorption, Water treatment.
Identifiers: *Virus removal, *Magnetic filtration, *Poliovirus.

The process of magnetic filtration was applied to the removal of T2 bacteriophage, MS2 bacteriophage, and poliovirus type 1 (Sabin) from water and wastewater. Since the effectiveness of this process is governed by the adsorption of the viruses onto the magnetic iron oxide seed, magnetite, those factors influencing adsorption were investigated. The adsorption of the three viruses studied to magnetite at a concentration of 500 ppm increased in the presence of cations, was not affected when the pH was varied from 5 tc 9, and could be described by the Freundlich adsorption isotherm. Viruses were suspended in two wastewater effluents and subsequently removed by magnetic filtration. Organic color interfered with the adsorption process. The interference was reduced by the addition of CaCl2, by the dilution of the wastewater with distilled water or by removing the organic color with activated carbon. Competition for adsorption was also exerted by 100 ppm of egg albumin, casein and dextran resulting in a significant reduction in the removal of poliovirus. Additionally, the infectivity of the magnetite-bound viruses was studied. Poliovirus, adsorbed to magnetite, was 100% infective whereas T2 phage displayed a lower and somewhat variable infectivity.
W77-02214

EAGLE LAKE POLLUTION CONTROL PROJECT, EAGLE LAKE KANDIYOHI COUNTY, MINNESOTA, BENCH MARK STUDIES,
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 5G.
W77-02215

SANITARY-HYGIENIC EVALUATION OF THE RECYCLED WATER SUPPLY ON RAILROADS, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Zheleznodorozhnoi Gigieny, Moscow (USSR).
For primary bibliographic entry see Field 3E.
W77-02241

THE INFLUENCE OF WASTE WATERS ON ALGAE IN THE OPEN COLLECTOR OF ZAGREB AT IVANJA RIJEKA, (IN CROATIAN),
Zagreb Univ. (Yugoslavia). Institut za Biologijo.
For primary bibliographic entry see Field 5C.
W77-02268

WAYS OF PREVENTING THERMAL POLLUTION OF WATER BODIES BY WASTEWATERS OF NUCLEAR POWER PLANTS, (IN RUSSIAN),
For primary bibliographic entry see Field 5G.
W77-02271

PRELIMINARY SELECTION OF STORM-WATER BASINS SUITABLE FOR INFILTRATION OF RECLAIMED WATER IN NASSAU COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Albany, N.Y. Water Resources Div.
For primary bibliographic entry see Field 5G.
W77-02322

TANKS OF PANEL CONSTRUCTION.
For primary bibliographic entry see Field 8A.
W77-02325

CONSTRUCTION OF GOSCOTE SEWAGE PUMPING STATION,
For primary bibliographic entry see Field 8C.
W77-02326

AUSTIN'S 11 MILE SEWER TUNNEL REFLECTS SOUND ECONOMIC, ENVIRONMENTAL ALTERNATIVES,
Austin City Dept. of Construction Management, Tex.
A. M. Eldridge.
Civil Engineering-ASCE, Vol. 46, No. 8, p 52-55, August, 1976. 1 fig.

Descriptors: *Sewers, *Tunnels, *Interceptor sewers, *Municipal wastes, *Construction, Tunnel design, Tunnel construction, Hydraulics, Sewage treatment, Hydrogen sulfide, Odor, Corrosion, Design criteria, Tunnel linings, Materials, Flow, Liquid wastes, Cities, Texas.

An 11-mile, $20 million continuous sewer tunnel which extends across the city of Austin, Texas is described. The sewer tunnel is designed to serve as a sanitary sewer and obviates about 98,000 ft of relief sewer construction work. Anticipating a maximum flow rate of 131 million gallons/day for the year 2020 and an allowable slope of about 0.00066, the lower end of the tunnel is sized for a finished diameter of 96 in. Maximum velocity is expected to be about 4.6 ft/sec at the maximum future flow rate. The tunnel is fitted in places with removable cunnette inserts which provide the hydraulic characteristics of a 24-inch pipe for low flow conditions. Measures being taken to prevent hydrogen sulfide buildup in the tunnel along with the usually associated problems of odors and corrosion include: the provision of air-excluder gates at each inlet shaft and the use of specially designed inlet vortex chambers, T-lock polyvinyl chloride lining, and limestone coarse aggregate for the 12-inch concrete lining of the tunnel. In addition to relieving many existing sewers from periodic overflows, the all-gravity flow design of the crosstown interceptor reflects substantial long-range savings over the more conventional cut and cover alternative. (Kreager-FIRL)
W77-02327

THURROCK BEATS PEAT WITH PILED PIPES,
For primary bibliographic entry see Field 8E.
W77-02328

TEST NEW SEWERS WITH LOW-PRESSURE AIR,
For primary bibliographic entry see Field 8G.
W77-02329

PRECAST SEGMENTS SPEED INSTALLATION OF THUNDER BAY SEWER,
For primary bibliographic entry see Field 8F.
W77-02330

THE DESIGN AND CONSTRUCTION OF A SCREENING AND PUMPING STATION AND AN OUTFALL FOR THE DISPOSAL OF SEWAGE FROM BRIGHTON AND HOVE,
For primary bibliographic entry see Field 5E.
W77-02331

PLASTIC LINING OVERCOMES RUGGED TERRAIN,
Bement, Dainwood and Sturgeon, San Diego, Calif.
For primary bibliographic entry see Field 8G.
W77-02333

FLOW DATA COLLECTION FOR INFILTRATION-INFLOW ANALYSIS,
Whitman, Requardt and Associates, Baltimore, Md.
J. S. Maynes.
Journal Water Pollution Control Federation, Vol 48, No 8, p 2055-2061, August, 1976. 2 fig, 4 ref.

Descriptors: *Cost-benefit analysis, *Inflow, *Infiltration, *Treatment facilities, *Leakage, Surface waters, Groundwater, Flow, Cities, Urban runoff, Runoff, Pumping plants, Maryland.
Identifiers: Baltimore.

An analysis of the cost-effectiveness of continuing to transport and treat inflow (leakage from surface run-off resulting from rainfall) and infiltration (leakage originating from the groundwater table) versus eliminating these flows through a rehabilitation program was performed for the Baltimore, Maryland area over a 20-year planning period. The amount of infiltration was determined by comparing the observed average daily flows with computed flows, and inflow was determined by comparing the observed peak flow rate resulting from rainfall with the flow rate from a twin-day comparison. The annual flow records for two treatment plants in the area revealed that infiltration composed about 30% of the average daily flow, while infiltration flows for pumping stations ranged between 1-62%. In general, it appeared to be more economical to continue to transport and treat these infiltration flows rather than to identify and correct the sources. An exception to this involved several pumping stations which required three or more repumping operations downstream before the flow arrived at the treatment plant. Inflow quantity, on the other hand, was found to equal one-half of a station's pumping capacity. It generally appeared to be more cost-effective to correct sources contributing to extraneous flows in valleys that were currently fully developed and did not have relief interceptors planned. (Kreager-FIRL)
W77-02334

SUSPENDED SLUDGE SCRAPER FOR ARCUATE SEDIMENTATION ZONE,
Union Carbide Corp., New York. (Assignee).
J. F. Pelton.
United States Patent 3,977,974. Issued August 31, 1976. Official Gazette of the United States Patent and Trademark Office, Vol 949, No 5, p 2027-2028, August, 1976. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Separation techniques, *Sludge, *Sedimentation, Equipment, Waste treatment, Solid wastes, Liquid wastes, Design criteria.

A patent for a waste water treatment device that allows for separation of solids from the liquid in a sedimentation zone is described. The device consists of two circular concentric walls spaced apart to form an intermediate volume. A first radial partition extends across the intermediate volume and is joined at opposite edges to the inner and outer walls, while a second radial partition is similarly located and spaced from the first partition to form an arcuate sedimentation zone. Means for introducing a liquid-solid feed in the arcuate sedimentation zone are provided to achieve a solids-depleted liquid in the upper part of the zone and a layer of settled solids in the bottom part of the zone. Means are also provided for discharging the solids-depleted liquid from the upper zone and for collecting the settled solids from the bottom part of the zone. The solids collection means include a mechanically driven bridge which moves in an arcuate path around the arcuate sedimentation zone and a scraper blade extending transversely across the sedimentation zone at the bottom thereof. (Kreager-FIRL)
W77-02335

CLARIFICATION PLANT,
J. R. Kaelin.
United States Patent 3,979,294. Issued September 7, 1976. Official Gazette of the United States Patent and Trademark Office, Vol. 950, No. 1, p 265, September, 1976. 1 fig.

Descriptors: *Patents, *Activated sludge, *Biological treatment, *Sewage treatment, *Recycling, Oxygenation, Design criteria, Equipment, *Waste water treatment.

A patent for an activated sludge clarification plant is described which provides for recycling of the activated sludge. The plant consists of at least one gas-tight activation tank provided with a surface ventilation rotor, a reclarification tank, inlet means for supplying sewage to the activation tank, and outlet means for conducting activation sewage to the reclarification tank. A conduit with one of its ends vertically oriented in the activation tank directly below the surface ventilation rotor is connected at its other end to the reclarification tank for recycling activated sludge concentrate from the reclarification tank to the activation tank. An outlet aperture in one end of the conduit is located in the suction zone of the surface ventilation rotor such that the activated sludge in the conduit is sucked upward through the surface ventilation rotor zone. Means are also provided for supplying pure oxygen to the other end of the conduit for application to the concentrated recycled activated sludge prior to the sludge's entry into the surface ventilation rotor. (Kreager-FIRL)
W77-02337

FREEING WASTE WATER FROM NITROGENOUS CPDS - USING PARTIALLY OXIDISED SLUDGE AS SOURCE OF ORGANIC CARBON.
South African Patent ZA 7505-682. Issued September 5, 1975. Derwent French Patents Abstracts, Vol. X, No. 37, p D2-D3, August, 1976.

Descriptors: *Patents, *Waste water treatment, *Nitrogen compounds, *Nitrification, *Denitrification, Biological treatment, Oxidation, Chemical reactions, Liquid wastes, Chemical wastes, Nitrates, Nitrogen, Ammonia, Biomass, Microorganisms.

A patent for a process that removes nitrogen compounds from waste water is described. The process involves mixing the waste water with active nitrifying organisms and an oxygen-containing gas to convert the nitrogenous material to the nitrate form. The nitrifying organisms and accumulated biomass are then separated from the waste water and recycled to the nitrification contacting step. A portion of the accumulated biomass is either periodically or continuously removed from the nitrifying step. The nitrified waste water is then contacted with heterotrophic denitrifying bacteria in the presence of a source of organic carbon to reduce nitrate nitrogen to elemental nitrogen. The denitrifying organisms and accumulated biomass are separated from the waste water and recycled to the denitrification step, with a portion of the accumulated biomass being either periodically or continuously removed from the denitrifying step. The process is improved by heating the biomass removed from the nitrifying and denitrifying steps in the presence of an oxygen-containing gas at 175-315C at an oxygen partial pressure of 5-250 pounds/sq in to partially oxidize the biomass and convert the organic nitrogen to ammonia nitrogen. The solid phase is then separated from the liquid phase of the oxidized mixture; and after ammonia is removed from the liquid phase, the latter is directed to the denitrifying step as a source of carbon. (Kreager-FIRL)
W77-02339

FLUID SAMPLER AND OXYGEN METER FOR SEWAGE PROCESSING - BIOLOGICAL OXYGEN DEMAND DETAILED CONTINUOUSLY BY REACTION VESSEL READ-OUT.
For primary bibliographic entry see Field 5A.
W77-02340

COMBINED FILTER AND DRYER FOR SEWAGE SLUDGE ETC. - USES BAND OF VACUUM FILTER TO CARRY CAKE THROUGH FILTER PRESS.
French Patent FR 2289-453. Issued October 30, 1975. Derwent French Patents Abstracts, Vol. X, No. 36, p D4, May 28, 1976.

Descriptors: *Patents, *Sewage sludge, *Drying, *Sludge treatment, *Filters, Equipment, Waste treatment, Dewatering, Solid wastes, Filtration.

A patent for a sewage sludge filter and dryer combination is described. The device combines a vacuum band filter with a filtrate expressing unit. A porous band which carries the filter cake from its passage around a partly-immersed vacuum filter drum moves horizontally into the expressing unit where it is squeezed between a porous drainage plate below the band and a fluid-pressurized, impervious membrane above the cake. The machine is programmed so that the drum

rotates periodically to advance the band only when the expressing unit is inactive. The device is useful for drying sludges prior to incineration and is easily installed. (Kreager-FIRL)
W77-02341

SEWAGE SURFACE AERATOR - WITHOUT AXIAL THRUST THUS REDUCING VIBRATION FROM WAVES.
German Patent DS 2120-576. Issued September 9, 1976. Derwent German Patents Abstracts, Vol. X, No. 38, p D1, October 27, 1976.

Descriptors: *Patents, *Rotors, *Aeration, *Sewage treatment, Flow, *Waste water treatment, Equipment, Design criteria, Liquid wastes.

A patent for a sewage surface aerator rotor that reduces vibration from waves by avoiding axial thrust is descried. The aerator rotor consists of a driven vertical shaft to which several vanes are attached by means of a circular support. The vanes lie in vertical planes containing the rotor axis or planes parallel to it which extend beyond the edge of the circular support when seen axially from above. The vanes are at least partially immersed in the water. The effective surfaces of the rotor are arranged so that they do not produce any axial force components, either individually or together. The vanes extend from the support first downwards and outwards and then parallel to the shaft in the region of immersion. The rotor is immersed in the water only to the point where in operation the support is either not subject to flow or only to flow in a direction free from axial thrust. (Kreager-FIRL)
W77-02342

COLESHILL ADVANCED WASTEWATER TREATMENT PROJECT,
G. F. G. Clough, and A. D. Maskell.
Proceedings of the Institution of Civil Engineers, Vol. 60, Part 1, p 383-400, August, 1976. 7 fig, 2 tab, 6 ref.

Descriptors: *Treatment facilities, *Tertiary treatment, *Waste water treatment, *Biological treatment, *Physical control, Activated sludge, Sludge treatment, Dewatering, Filtration, Settling basins, Separation techniques, Sewage treatment, Economics, Flocculation, Activated carbon, Lime, Evaluation, Performance.
Identifiers: Recarbonation.

A full-scale advanced waste water treatment installation at Coleshill, Great Britain is described. The facility utilizes mobile process units which allow for the linking up of various experimental treatment sequences. The basic treatment steps employed at the facility include: lime addition and flocculation, primary settling, recarbonation and secondary settling, sludge consolidation, multimedia filtration, activated carbon treatment, activated sludge treatment, and final settling. A sludge dewatering facility is also provided. Initially, physical-chemical processes for sewage treatment are being examined. An important objective of the experimental waste water treatment program is to obtain information on which an economic assessment of advanced waste water treatment can be based. (Kreager-FIRL)
W77-02344

ADVANCED WASTE TREATMENT PLANT HAS PHYSICAL-CHEMICAL OPTION,
Buchart-Horn, Lewisburg, Pa.
D. L. McDowell, and M. Goldman.
Public Works, Vol. 107, No. 9, 2 p, September, 1976.

Descriptors: *Waste water treatment, *Tertiary treatment, *Treatment facilities, *Municipal wastes, *Biological treatment, Design criteria, Flocculation, Chlorination, Aeration, Oxidation, Equipment, Filtration, Chemical oxygen demand, Suspended solids, Liquid wastes.

The design of an advanced municipal waste water treatment plant with physical-chemical options is described. Waste water passes through a grit chamber and comminutor to a pumping station, and the pumped wastes are discharged directly to twin oxidation ditches which are circular and have a common wall. The oxidation ditches are designed to provide a 24-hour retention period at a design flow rate of 130,000 gallons/day. The remaining plant features to achieve advanced waste water treatment consist of triple-media filters (equipped for backwash and surface wash) operating in conjunction with flocculation equipment and tube settlers plus a chlorine contact tank. An aerated equalization tank of reinforced concrete intervenes between the clarifier and filter complex to maintain a constant feed to the filters. The flocculator and tube settler are incorporated into the design for phosphorus removal if desired or for physical chemical treatment of raw waste water. A chemical feed system is also built into the plant for phosphorus removal. A chlorine contact tank capable of dosing up to 27 pounds of chlorine/day at the design flow also serves as a reservoir for filter backwash water. The filtered effluent is expected to have a chemical oxygen demand of 25 milligrams/liter and a suspended solids level of 4 milligrams/liter. (Kreager-FIRL)
W77-02345

PHOSPHORUS REMOVAL WITH ALUM FROM SECONDARY EFFLUENT,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
D. E. Francisco, M. Strauss, and B. A. Dempsey.
Journal Water Pollution Control Federation, Vol. 48, No. 8, p 2002-2006, August, 1976. 1 fig, 5 tab, 12 ref.

Descriptors: *Waste water treatment, *Phosphorus, *Phosphates, *Chemical wastes, *Chemical properties, Biological treatment, Performance, Efficiencies, Evaluation, Calcium, Hardness(Water).
Identifiers: Alum, Sodium tripolyphosphate.

The effect of sodium tripolyphosphate on alum removal of phosphorus from synthetic raw waste water samples was investigated. Waste waters containing different forms of phosphorus (orthophosphate, sodium tripolyphosphate, and combinations of the two) were biologically treated in a 5-hour detention activated sludge unit prior to the treatment of the effluents with alum in a jar test apparatus. While phosphorus removal increased with alum dosage to an alum:phosphorus ratio of 1.8 in all samples, there were no significant differences between the samples in terms of alum requirements for phosphorus removal. Thus, previous findings suggesting that sodium tripolyphosphate raises the alum requirement for phosphorus removal in waste water were not duplicated in this study. Apparently some other constituent in the waste water, either alone or in combination with sodium tripolyphosphate, was responsible for previously observed alum requirement increases. The effect of calcium hardness on phosphorus removal by alum was also investigated, and a hardness of 150 milligrams/liter was found to decrease the amount of alum required for an equivalent alum dosage. (Kreager-FIRL)
W77-02346

DENITRIFICATION OF NITRIFIED SEPTIC TANK EFFLUENT,
Wisconsin Univ., Madison. Dept. of Soil Science.
L. J. Sikora, and D. R. Keeney.
Journal Water Pollution Control Federation, Vol. 48, No. 8, p 2018-2025, August, 1976. 7 fig, 2 tab, 26 ref.

Descriptors: *Denitrification, *Septic tanks, *Feasibility studies, *Waste water treatment, *Nitrates, Kinetics, Chemical reactions, Monitoring, Oxidation, Reduction(Chemical), Performance, Measurement, Limestones, Alcohols.
Identifiers: Methanol.

Denitrification of nitrified septic tank effluent was achieved in continuous flow columns packed with limestone chips using methanol as an energy source. Nearly complete nitrate removal was attained in 17 hr at 5 C, 13 hr at 13 D, and in less than 2 hr at 20 C. The general kinetics of the systems were best depicted as first order. An Arrhenius relationship was also demonstrated, with the calculated activation energy being 12.25 kilocalories/mole of nitrate nitrogen. Nitrogen was the gas detected in highest concentrations, but oxygen, methane, and occasionally carbon dioxide were also present in the system. Oxidation-reduction potentials in the columns were generally in the 100-200 millivolt range. The performance of in situ oxidation-reduction electrodes during the denitrification experiment demonstrated their potential use for monitoring the efficiency of operating field systems. Carbon analyses performed during denitrification at 5 C revealed a ratio of 0.89 milligrams of methanol carbon oxidized to 1 milligram of nitrate nitrogen reduced.
W77-02347

WASTE WATER PROCESSING WITH HGMS (HIGH GRADIENT MAGNETIC SEPARATORS),
Bechtel International Corp., San Francisco, Calif.
R. R. Oder, and B. I. Horst.
Filtration and Separation, Vol. 13, No. 4, p 363-364, 366, 368-369, 377, July/August, 1976. 5 fig, 10 tab, 15 ref.

Descriptors: *Waste water treatment, *Suspended solids, *Tertiary treatment, *Magnetic studies, *Separation techniques, Liquid wastes, Economics, Feasibility, Efficiencies, Municipal wastes.
Identifiers: *High gradient magnetic separators.

A conceptual process for high gradient magnetic separation treatment of municipal secondary effluent based on recent bench-top laboratory results was used as a model for comparison with more conventional solids separation techniques. The conceptual process is designed for 80-90% solids reduction when processing typical municipal secondary effluents containing a nominal 50 ppm suspended solids. Estimated high gradient magnetic separator treatment costs for waste water treatment plants with 1, 10, and 100 million gallon/day capacities were 68, 22, and 15 cents, respectively. For process capacities of 10 million gallons/day, these costs compare favorably with those of conventional two-stage tertiary lime treatment. In addition, high gradient magnetic separators also offer economy of space. (Kreager-FIRL)
W77-02348

NITRIFICATION IN HIGH-SLUDGE AGE CONTACT STABILIZATION,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
J. Zoltek, Jr., and L. Lefebvre.
Journal Water Pollution Control Federation, Vol. 48, No. 9, p 2183-2189, September, 1976. 4 fig, 1 tab, 11 ref.

Descriptors: *Nitrification, *Waste water treatment, *Activated sludge, *Kinetics, *Ammonium compounds, *Nitrogen compounds, Organic compounds, Nitrates, Chemical reactions, Biological treatment, Oxidation, Feasibility studies, Aeration.
Identifiers: *Contact stabilization.

Nitrification of raw waste water in a high-sludge age, contact-stabilization activated sludge plant was investigated. The unit substrate (ammonium ion nitrogen) removal rate was directly proportional to the overall substrate removal rate and inversely proportional to the mass of the activated sludge. Initial hydrolysis of organic nitrogen to ammonia proceeded quite rapidly during the early stages of aeration for raw waste water, but then

began to level off at a very slow rate. Unless the return sludge ratio is very high, contact stabilization modification of activated sludge systems does not appear to be feasible for producing a substantial degree of oxidation of ammonia nitrogen and organic nitrogen to nitrate nitrogen when raw waste is treated. (Kreager-FIRL)
W77-02349

EMERGENCY REPAIR OF A DEEP STORM SEWER LINE,
For primary bibliographic entry see Field 8G.
W77-02350

MINNEAPOLIS-ST. PAUL: LAND OF THE 'SHINING BIG-SEA-WATERS',
Metropolitan Waste Control Commission, St. Paul, Minn.
T. J. Vandervoort, and K. A. Denisen.
Journal Water Pollution Control Federation, Vol. 48, No. 9, p 2107-2113, September, 1976.

Descriptors: *Waste water treatment, *Water quality, *Water pollution control, *Treatment facilities, *Minnesota, Surface waters, Rivers, Lakes, Biological oxygen demand, Dissolved oxygen, Suspended solids, Construction, Sewers, Programs, Monitoring, Municipal wastes.
Identifiers: *Minneapolis-Saint Paul(Minn).

Efforts by the Minneapolis-Saint Paul Metropolitan Waste Control Commission to upgrade waste water treatment facilities in the area and to improve the water quality of lakes and rivers in the region are reviewed. Only three of 33 waste water treatment plants in 1971 met all state and federal effluent standards consistently, and the overall average removal efficiencies of biochemical oxygen demand and total suspended solids were 68% and 78%, respectively. Since that time, seven outmoded waste water treatment plants have been phased out, and existing plants have been upgraded so that by the end of 1974, 13 out of 21 treatment plants consistently met the secondary treatment definition set forth by the Environmental Protection Agency. In 1973 two new treatment plants were placed in operation, one being the first full-scale physical-chemical treatment facility in the nation. Nearly 100 miles of new sewer interceptors were also constructed. During 1975 the Commission routinely sampled 26 locations on six rivers and one creek for over 50 water quality parameters. Dissolved oxygen concentrations in the Mississippi, Minnesota, and Saint Croix Rivers during 1975 were never below the 5 milligram/liter standard in contrast to dissolved oxygen concentrations of below 1 milligram/liter which were observed in 1970. (Kreager-FIRL)
W77-02351

HEAVY METALS-INDUCED DEFLOCCULATION OF ACTIVATED SLUDGE,
Pittsburgh Univ., Pa. Water and Environmental Engineering Program.
R. D. Neufeld.
Journal Water Pollution Control Federation, Vol. 48, No. 8, p 1940-1947, August, 1976. 11 fig, 9 ref.

Descriptors: *Activated sludge, *Waste water treatment, *Heavy metals, *Flocculation, *Biological treatment, Biomass, Performance, Sludge, Microorganisms.
Identifiers: *Deflocculation.

The influence of shock loadings of heavy metals (mercury, cadmium, and zinc) on activated sludge deflocculation was investigated in cultures maintained in a captive condition with no deliberate sludge wasting. No operational difficulties in terms of the underflow control of gravity cell separators are anticipated based on the above experiments, but potential problems involving the possibility of substantial loss of biomass in the form of pinpoint discrete solids over the effluent weir of gravity separators can be expected as a result of heavy metal shock loadings. Such problems may be overcome by using polyelectrolytes or other types of liquid solid separators (sand filters for effluent polishing or continuous centrifuges for cell separation) in conjunction with cell recycling. Maximum deflocculation in the experimental continuous culture system used occurred after 3-4 days for mercury addition, 12-14 days for cadmium addition, and 10-12 days for zinc addition. While deflocculation did not result at cadmium and zinc levels lower than 20 or 40 milligrams/liter, respectively, virtually any mercury level resulted in some degree of deflocculation. (Kreager-FIRL)
W77-02352

SALT WATER DOMESTIC WASTE TREATMENT,
Rice Univ., Houston, Tex. Dept. of Environmental Science and Engineering.
M. A. Kessick, and K. L. Manchen.
Journal Water Pollution Control Federation, Vol. 48, No. 9, p 2131-2136, September, 1976. 6 fig, 17 ref.

Descriptors: *Domestic wastes, *Saline water, *Waste water treatment, *Water conservation, *Coagulation, Flocculation, Organic compounds, Suspended solids, Turbidity, Biodegradation, Bacteria, Salinity, Physical properties, Chemical properties, Waste disposal, Lime.
Identifiers: Alum.

The feasibility of using salt water as a flush medium for domestic wastes was investigated, with particular emphasis on the effect of salt water wastes on coagulation and flocculation processes which are normally used in the first step of any physical-chemical treatment process. Laboratory experiments with samples of primary domestic waste water containing sea salts indicated that increasing the salt content of such waste water causes no net precipitation or salting out of organic material. Alum and lime proved to be effective coagulants for simulated salt water domestic waste. Alum coagulation was equally effective for turbidity and organic content removal in both fresh and salt water waste samples; while the addition of lime was associated with an increase in the nonsettleable organic fraction, although the turbidity was still reduced. Biodegradation of the soluble fraction of domestic waste with resident bacteria was unaffected by sea salt to levels expected in a seawater waste system. However, sea salt addition markedly inhibited the biodegradation of the suspended fraction. Thus, if the suspended fraction of salt water domestic wastes is dumped in the ocean, it may not exert an oxygen demand equivalent to that exerted in freshwater environments when metabolized by members of the waste's own resident microbial population. (Kreager-FIRL)
W77-02353

SOLAR SEWAGE PLANT 75% ENERGY SELF-SUFFICIENT.
Engineering News-Record, Vol. 197, No. 12, p 20, September, 1976. 1 fig.

Descriptors: *Waste water treatment, *Municipal wastes, *Treatment facilities, *Solar radiation, *Recycling, Biological treatment, Heat transfer, Symbiosis, Economics, Energy transfer, Methane, Construction, Design criteria, Liquid wastes, Maine.

The design of a 450,000-gallons/day primary and secondary waste water treatment plant that will treat waste water from 4200 residents of rural Wilton, Maine, using solar energy as an integral part of the biological treatment process is described. The sun's radiance will heat the process via solar collectors from the time waste water enters the plant through economical screw pumps until the treated effluent is passed through energy recycling heat pumps and out into a small stream. The plant's components are to be stacked and compacted to conserve heat and to allow waste water to flow in short runs, for the most part by gravity. The building is shaped to hold snow on the roof and sides for natural insulation and is located in a man-made dish so that sunlight reflecting off snow-covered hills can be used for heating. Methane gas which is generated by the sludge digestion process will be stored in tanks for heating the building on rainy days, running an electric generator, and for use as a back-up heat source for the digesters. The projected result is a treatment plant that will supply more than 75% of its own energy requirements, saving roughly $4450/yr in fuel and electricity costs. (Kreager-FIRL)
W77-02354

THE INFLUENCE OF THE RAW WATER CONDITIONING ON THE WORKING DATA OF A REVERSE OSMOSIS PLANT TO PRODUCE ULTRA-PURE WATER (EINFLUSS DER ROH-WASSERKONDITIONIERUNG AUF BETRIEBSDATEN EINER UMKEHROSMOSE-ANLAGE ZU REINSTWASSERERZEUGUNG),
O. K. Marquardt.
Vom Wasser, Vol. 45, p 129-158, 1975. 13 fig, 6 tab.

Descriptors: *Reverse osmosis, *Desalination, *Waste water treatment, *Reclaimed water, *Saline water, Reclamation, Liquid wastes, Performance, Ion exchange, Fouling.

The use of reverse osmosis to produce reclaimed water from water contaminated by salt is discussed, with particular emphasis on the importance of raw water preconditioning. Less than satisfactory performance obtained with reverse osmosis units in the past is attributed to a lack of raw water pretreatment which is especially important when polyamide hollow fiber-membranes are used in reverse osmosis units. Raw water conditioning will reduce the fouling index of reverse osmosis units such that special rinses are necessary only at infrequent intervals. The use of raw water conditioning to reduce the passage of salt through reverse osmosis units also allows for the effective utilization of ion exchange treatment after the reverse osmosis process. (Kreager-FIRL)
W77-02355

SPRAY IRRIGATION SOLVES DISPOSAL PROBLEM,
Van Note-Harvey Associates, Princeton, N.J.
W. B. Harvey.
Water and Wastes Engineering, Vol. 13, No. 10, p 31-33, October, 1976.

Descriptors: *Irrigation, *Waste water disposal, *Waste water treatment, Spraying, *Municipal wastes, Crops, Biological treatment, Tertiary treatment, Aeration, Chlorination, Pumps, Valves, Symbiosis, Water reuse, Monitoring, Sampling activated sludge, Farms, New Jersey.
Identifiers: *Spray irrigation.

A spray irrigation system that will ultimately remove 1.0 million gallons/day of municipal wastes from direct river discharge is described. The system which is located in East Windsor, New Jersey is one of the largest municipal spray irrigation applications in the northeast, serving a population of about 20,000. Sewage first enters a pumping station where it is screened for the removal of fibrous material. It is then pumped to a 300,000 gallon equalization basin, and heavier grit and inorganic material are settled in a conical section of the basin's bottom. Effluent from the basin is then pumped to activated sludge units, and the flow is subsequently polished in an aerated lagoon which provides tertiary treatment. After tertiary treatment, the effluent is chlorinated. Two deep-well turbine pumps lift the polished effluent to the irrigation site where 80 acres of hay are treated with 600,000 million gallons/day of the effluent. Different valve combinations are used to achieve the

proper waste water application over different portions of the site. A network of 13 test wells is located throughout the site to sample groundwater. (Kreager-FIRL)
W77-02356

FEASIBILITY OF HIGH-ENERGY ELECTRON TREATMENT OF MUNICIPAL SLUDGE,
Massachusetts Inst. of Tech., Cambridge. Dept of Electrical Engineering and Computer Science.
J. G. Trump, K. A. Wright, A. J. Sinskey, E. W. Merrill, and D. B. Shah.
American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 151, p 367-374, 1975. 9 fig, 9 ref.

Descriptors: *Waste water treatment, *Sludge treatment, *Municipal wastes, *Ionization, Feasibility studies, *Disinfection, Electronics, Bacteria, Viruses, Parasitism, Economics, Chemical oxygen demand, Radiation.
Identifiers: Ionizing radiation, *Electron beam treatment.

Studies on the feasibility of using high-energy electrons for the disinfection of municipal sludge and waste water are reported. Small quantity irradiation studies using a 3-million electron volt Van de Graaff electron accelerator indicate that high energy electrons can be used to adequately control bacteria, viruses, and parasites. In addition to primary disinfection and deinfestation of waste water and sludge, electron radiation also appears capable of achieving substantial chemical oxygen demand reductions if adequate oxygen is available. Currently, an investigative system for testing 100,000 gallons/day of sludge with 400,000 rads is being constructed. The facility will use a standard 50 kilowatt electron beam system. Capital and operating cost estimates for a modular electron injection unit capable of treating 100,000 gallons/day of sludge are projected at $500,000 and $100,000/yr, assuming that 450,000 rads proves to be an adequate minimum dosage and that electron beam power can be utilized to produce this minimum dosage with an overall utilization efficiency of 33.3%. (Kreager-FIRL)
W77-02357

WASTEWATER REUSE-INDUSTRIAL, MUNICIPAL, OR BOTH,
Maintenance Engineering Corp., Houston, Tex.
B. R. Fritsche, and R. W. Schima.
American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 151, p 242-247, 1975. 3 tab.

Descriptors: *Water reuse, *Waste water treatment, *Industrial wastes, *Municipal wastes, *Industrial water, Reclaimed water, Recycling, Symbiosis, Liquid wastes, Dissolved solids, Phosphorus, Ammonia, Sodium, Chlorides.

The reuse of industrial and/or municipal waste water for industrial water needs is discussed. Although municipal waste water is adaptable for limited reuse (cooling water and process water) with minor pretreatment, municipal treatment processes increase the total dissolved solids level (sodium and chloride) significantly which in turn increases water consumption, pretreatment costs, and internal treatment costs. Such increases in total dissolved solids do not occur in industrial process waste water. Also, if municipal waste water is to be used in steam generation systems, phosphorus removal is necessary; ammonia removal may also be necessary, depending on the use of the steam. The only type of industrial waste water that can be considered for reuse is process waste water since cooling water and boiler water blowdowns are normally concentrated with respect to scale formation and corrosion, making these streams impracticable for reuse under circumstances where further concentration occurs or adverse conditions exist. Although industrial waste water may contain process contaminants which must be removed prior to reuse, the utilization of industrial waste water may significantly reduce water consumption requirements. (Kreager-FIRL)
W77-02358

OPEN TANK PURE OXYGEN SYSTEM BEGINS OPERATION,
Illinois State Univ., Normal. Coll. of Applied Science and Technology.
A. R. Jacobson.
Public Works, Vol. 107, No. 9, p 106, September, 1976.

Descriptors: *Activated sludge, *Sewage treatment, *Municipal wastes, *Oxygenation, *On-site tests, Aerobic conditions, Performance, Evaluation, Efficiencies, Treatment facilities.

A pure oxygen activated sludge demonstration system using uncovered tanks has begun operation under a grant from the Environmental Protection Agency at the Metropolitan Denver Sewage Disposal District Number 1 Plant. For the demonstration, one of 36 diffused air activated sludge basins was converted to an open-tank oxygen system by installing rotating active diffusers and associated oxygen control equipment suited to a wide range of loading conditions. Effluent from this tank passes to one of 12 final clarifiers which has been isolated from the rest of the plant. The diffusers rotate slowly in the mixed liquor, producing very fine micron-size bubbles that achieved 90% or greater oxygen transfer. Electrical signals from dissolved oxygen sensors automatically regulate pneumatic oxygen control valves to satisfy the oxygen demand for a given point in the basin. The limiting factor of the system will be the solids and hydraulic loadings of the single clarifier. During the last phase of the project, the flow will be increased in steps from its current 10 million gallons/day until the upper operating limit of the system is determined. (Kreager-FIRL)
W77-02359

PACKAGED PLANT FOR VIRGIN ISLANDS.
For primary bibliographic entry see Field 8G.
W77-02360

GLASS COATED STEEL TANKS.
For primary bibliographic entry see Field 8G.
W77-02361

EFFICIENCY OF DIFFUSED AERATION SYSTEMS IN WASTEWATER TREATMENT,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
D. S. Mavinic, and J. K. Bewtra.
Journal Water Pollution Control Federation, Vol. 48, No. 10, p 2273-2283, October, 1976. 11 fig, 1 tab, 7 ref.

Descriptors: *Activated sludge, *Waste water treatment, *Aeration, *Oxygenation, Biological treatment, Bubbles, Flow characteristics, Efficiencies, Performance.
Identifiers: Diffused aeration systems.

Factors affecting the oxygenation efficiency of diffused aeration systems employed in activated sludge waste water treatment are examined. A process of aeration using a countercurrent flow of air bubbles and waste water is shown to result in increased contact time and thus higher oxygenation efficiencies. The operating conditions of the system are such that the average velocity of the water is equal to or less than the velocity of the rising air bubble in order to provide maximum contact times for countercurrent flow of air and water. The process can possibly be adapted to existing conventional aeration systems so that treatment efficiency can be improved. (Kreager-FIRL)
W77-02362

WASTEWATER PLANT DOES NICELY WITHOUT NATURAL GAS, THANK YOU,
Reading Sewage Treatment Plant, Pa.
L. Karnat.
Water and Wastes Engineering, Vol. 13, No. 10, p 25-26, October, 1976.

Descriptors: *Sewage treatment, *Treatment facilities, *Methane, *Energy conversion, *Digestion, Monitoring, Waste water treatment, Municipal wastes, Cities, Pennsylvania.
Identifiers: Reading(Penn), Fuel generation.

The use of on-site methane generation for supplying waste water treatment fuel gas needs at the sewage treatment plant in Reading, Pennsylvania is described. The plant produces an average of 150,000 cu ft of methane/day which is enough to supply heat for the two primary digesters and one secondary digester plus heat for two of the plant buildings. Methane is metered via two rotating-vaine type positive displacement meters installed on each of the two primary digesters. While measuring methane production, the meters also indicate whether the digesters are operating properly and show the amount of methane used to heat the digesters. The meters are also equipped with flow-totalizing readouts to provide statistical information on methane production required by the Commonwealth of Pennsylvania. Surplus methane is burned off by flares. (Kreager-FIRL)
W77-02363

DEGRADATION OF NTA ACID DURING ANAEROBIC DIGESTION,
Municipal Environmental Research Lab., Cincinnati, Ohio.
L. Moore, and E. F. Barth.
Journal Water Pollution Control Federation, Vol. 48, No. 10, p 2406-2409, October, 1976. 3 fig, 1 tab, 3 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Biodegradation, *Detergents, *Anaerobic conditions, Organic acids, Salts, Sludge, Performance, Evaluation, Biological treatment, *Nitrilotriacetic acid.
Identifiers: Sodium nitrilotriacetic acid, Detergent additives.

The degradability of the sodium salt of nitrilotriacetic acid, a proposed substitute for tripolyphosphate in synthetic detergent formulations, during anaerobic digestion of primary sludge and a mixture of primary and waste activated sludge was investigated. Experiments involving the addition of 20 milligrams/liter of the nitrilotriacetic acid salt to an anaerobic system containing only primary sludge did not reveal any degradation of the salt over a period of 120 days. However, when 20 milligrams/liter of the salt was added to an anaerobic system containing 50% primary sludge and 50% waste activated sludge that was acclimated to the degradation of sodium nitrilotriacetate, almost complete degradation was observed after 2 months. When this mixture of primary sludge and acclimated waste activated sludge was gradually returned over a 20-day period to a daily feed consisting entirely of primary sludge, degradation continued, indicating that the acclimated culture can be retained in the digestion process when the daily feed is returned to zero. (Kreager-FIRL)
W77-02364

DIGESTION IS A GOOD EGG IN LOS ANGELES,
J. F. Kam, and J. F. Schank.
Water and Wastes Engineering, Vol. 13, No. 10, p 28-29, October, 1976.

Descriptors: *Digestion tanks, *Construction, *Design criteria, *Waste water treatment, *Concrete structures, Equipment, Materials, Scum, Coatings, Corrosion control, Anaerobic conditions, California.
Identifiers: Grit, Los Angeles(Calif).

The use of egg-shaped anaerobic digestion tanks for a waste water treatment plant in the city of Los Angeles is reported. The tanks which are patterned after a German design possess the advantage that they don't accumulate grit and scum. The shell of the digester is built with post-tensioned concrete, with the bottom of the container being as steep as possible (generally under 45 degrees inclined from verticle) so that the digested sludge flows by gravity into the tip of the hopper. The digester reduces in area in an upward direction so that the scum area stays small compared with the digesting area. Dead corners that form deposit are avoided. Digester gas is bubbled at the circumference of the lower tank area to intensify the digestion and prevent scum formation. Screw impellers for scum destruction are installed at the top of the digesters. The inside of the digester above the sludge level is epoxy coated for corrosion protection. The middle section of the digester is constructed in sections (like an orange peel), whereby the forming and scaffolding are built for one section at a time, rotated into place, and used repeatedly. (Kreager-FIRL)
W77-02365

PILOT PLANT TRAVELS ON WHEELS.
The American City and County, Vol. 91, No. 10, p 98, October, 1976.

Descriptors: *Waste water treatment, *Pilot plants, *Sludge, *Dewatering, *Municipal wastes, Cities, *Treatment facilities, Evaluation, Performance, Alabama.
Identifiers: Birmingham.

A mobile pilot plant for evaluatiang the effectiveness of a clay-polymer drainage and evaporation system in improving the sludge clarification capabilities of two waste water treatment plants in the city of Birmingham, Alabama is described. The mobile plant is able to treat up to 100 million gallons/day of water during the clay-polymer test. Tests at a treatment facility with an 8.5 million gallons/day flow revealed that polymer and clay levels of 2.0 ppm and 8.0 ppm, respectively, were sufficient to obtain results that were superior to those obtained with conventional alum treatment. At a treatment plant with an average flow up to 50 million gallons/day, 1.2 ppm of polycationic polymer and 9.0 ppm of clay were used. The clay-polymer system produces finished water of good clarity and a low volume of sludge with good handling and dewatering properties. (Kreager-FIRL)
W77-02366

FLUID-BED REACTOR MAY CUT SEWAGE COSTS.
The American City and County, Vol. 91, No. 10, p 26, October, 1976.

Descriptors: *Biological treatment, *Activated sludge, *Waste water treatment, *Nitrification, *Denitrification, Domestic wastes, Municipal wastes, Pilot plants, Efficiencies, Evaluation, Performance, Economics, Tertiary treatment, Biomass.

A fluidized bed biological waste water treatment process that is potentially capable of reducing treatment plant capital costs for some municipalities is described. The process provides secondary biological treatment, nitrification, and denitrification for domestic sewage. The fluidized-bed reactors take up only one-fifth the space a standard activated sludge system requires. The process eliminates the huge concrete tanks and basins required for conventional waste water treatment by substituting compact fluidized bed reactors containing bacteria-coated media with a high biomass concentration and a short detention time. A pilot installation located at an advanced waste water treatment plant is achieving better than 99% denitrification. (Kreager-FIRL)
W77-02367

SANDWICH CONSTRUCTION G.R.P.
For primary bibliographic entry see Field 8G.
W77-02368

THERMOPHILLIC BIO-OXIDATION OF HIGH-STRENGTH ORGANIC WASTEWATERS AND SLUDGES,
Camp, Dresser and McKee Inc., Boston, Mass.
A. A. Kalinske.
American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 151, p 34-40, 1975. 2 fig, 3 tab, 13 ref.

Descriptors: *Biological treatment, *Waste water treatment, *Sludge treatment, *Thermophilic bacteria, *Activated sludge, Solid wastes, Temperature, Aerobic conditions, Microorganisms, Biochemical oxygen demand, Organic compounds, Digestion, Sewage sludge, Feasibility studies, *Oxidation.
Identifiers: Composting, *Bio-oxidation.

Processes for the thermophilic bio-oxidation of waste water and sludges containing high levels of organics are discussed. Thermophilic activated sludge treatment of waste waters with high levels of soluble organics appears to be feasible, especially if the waste water originates at a temperature of 40C or higher. At a 5-day biochemical oxygen demand above about 30 g/liter, sufficient heat can be generated so that the process is self-sustaining as far as temperature is concerned. Thermophilic organisms do not appear to have bioflocculating properties; thus their removal by plain settling is not possible. Aerobic digestion of sewage sludges and other organic solid wastes in liquid suspensions at high mesophilic and thermophilic temperatures (35-60C) is possible and can be self-sustaining at volatile solids concentrations above 3%. Composting of organic solid wastes by thermophilic aerobic organisms also appears feasible. Tests with a mechanical composting unit handling dewatered sewage solids having 75% moisture revealed that at a temperature of 60C and a retention time of about 6 days all pathogens were killed or inactivated. Recycle and forced aeration were used to achieve a final composted solids with a moisture content of 25% and a 6-day stabilization time. (Kreager-FIRL)
W77-02369

STUDIES OF THE REMOVAL OF AMMONIA NITROGEN BY ION EXCHANGE,
Greeley and Hansen, Chicago, Ill.
T. E. Wilson, and M. D. Riddell.
American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 151, p 118-125, 1975. 4 fig, 4 tab, 9 ref.

Descriptors: *Ion exchange, *Waste water treatment, Ammonia, *Zeolites, *Activated sludge, *Nitrogen compounds, Calcium, Pilot plants, Performance, Effluents, Liquid wastes, Municipal wastes, Treatment facilities, Separation techniques.
Identifiers: Clinoptilolite, *Ammonia nitrogen.

Pilot studies to evaluate the effectiveness of an ion exchange process using the natural zeolite, clinoptilolite, for removing ammonia nitrogen from the filtered secondary effluent generated by an activated sludge municipal waste water treatment plant were conducted. Ion exchange beds (6-feet deep) consisting of two columns with 3 ft of media were used. A sodium chloride-sodium hydroxide brine was generally used for regeneration of clinoptilolite. Effluent ammonia nitrogen levels often averaged less than 1.0 milligrams/liter for one-column operational mode but commonly averaged closer to 1.5 milligrams/liter for two-column operation. The calcium content of the influent did not appear to affect either the effluent ammonia concentration or the clinoptilolite's ammonia capacity. Calcium breakthrough tended to precede ammonia breakthrough and thus might be used as an early indicator of ammonia breakthrough. Both the ammonia and calcium capacities of the clinoptilolite tended to decrease with increasing hydraulic loading. Activated carbon pretreatment had no effect on effluent ammonia concentration. (Kreager-FIRL)
W77-02370

RECOVERY AND REUSE OF ALUM FROM WATER FILTRATION PLANT SLUDGE BY ULTRAFILTRATION,
Massachusetts Univ., Amherst. Environmental Engineering.
E. E. Lindsey, and C. Tongkasame.
American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 151, p 185-192, 1975. 5 fig, 2 tab, 6 ref.

Descriptors: *Sludge treatment, *Recycling, *Aluminum, *Waste water treatment, *Filtration, Byproducts, Membrane processes, Economics, Coagulation, Sludge disposal, Symbiosis, Color, Organic compounds.
Identifiers: Alum, *Ultrafiltration.

A system for the recovery and reuse of alum from water filtration plant sludge by ultrafiltration is described. The settled, used sludge from water treatment is acidified with sulfuric acid to a pH of about 2.5, and the clarified overflow from the acidification is subjected to ultrafiltration at a pressure differential of about 50 lb/sq in with an acid-resistant synthetic copolymer membrane. A portion of the solution which does not go through the membrane contains most of the color and the high molecular weight organics removed by the alum floc. Since the underflow from acidification is relatively small in volume and more easily dewaterable, there is a greatly reduced problem in ultimate disposal. The solution through the membrane contains up to 90% of the original aluminum in a soluble form that is suitable for reuse as a coagulant after pH adjustment. A cost comparison with other means of sludge disposal such as landfill shows that the recovery system can result in significant savings. (Kreager-FIRL)
W77-02371

ASPECTS OF SLUDGE TREATMENT,
F. A. Shabi, and M. J. Hanbury.
Effluent and Water Treatment Journal, Vol. 16, No. 7, p 343-346, 350-351, July, 1976. 2 fig, 5 tab, 7 ref.

Descriptors: *Sludge treatment, *Dewatering, *Coagulation, *Anaerobic conditions, *Oxidation, Waste treatment, Filtration, Centrifugation, Flocculation, Solid wastes, *Waste water treatment, Liquid wastes, Separation techniques, Treatment facilities, Polyelectrolytes.

Waste water sludge treatment processes being utilized in Great Britain are reviewed. The most widely used sludge treatment process in Great Britain is anaerobic digestion which serves about half of Britain's population. Dewatering by mechanical means (filter press, vacuum filtration, and centrifugation), however, is becoming increasingly more attractive both in terms of cost and convenience. Sludge pretreatment to achieve flocculation or coagulation of the sludge particles is achieved either by thermal conditioning or by the addition of chemical coagulants. The development of polyelectrolytes which can be added in very small quantities (about 1%) to achieve sludge particle coagulation has improved the efficiency of sludge mechanical dewatering systems as illustrated by a sludge concentrator which is capable of producing a cake with a solids content in the range of 8-16%. The use of wet air oxidation in waste water treatment is another means of making the residual sludge more amenable to dewatering. At one facility using this waste water treatment modality, the utilization of overloaded drying beds was extended by eight-fold, while the sludge volume was reduced by over 80%. (Kreager-FIRL)
W77-02372

A DISCOURSE ON THE BIOCHEMICAL OXIDATION OF SEWAGE,
T. Stones.
Effluent and Water Treatment Journal, Vol. 16, No. 7, p 352-355, July, 1976. 4 tab, 21 ref.

Descriptors: *Sewage treatment, *Biological treatment, *Kinetics, *Biochemical oxygen demand, *Dissolved oxygen, Domestic wastes, Nitrification, *Oxidation, Chemical reactions, *Waste water treatment, Oxygen demand.

The kinetics of the biochemical oxidation of settled domestic sewage was investigated. Data obtained from experiments in which the dissolved oxygen contents of portions of 1/100 dilution of settled domestic sewage were determined at various intervals during incubation over 20 days at 20C were substituted into an expression for a second-order reaction. The results was a reasonably constant value throughout a period of about 10 days. During this period, therefore, the course of biochemical oxidation closely followed a second-order reaction, with the rate of oxidation at any instant over this period being governed jointly by the residual dissolved oxygen concentration and the unsatisfied biochemical oxygen demand. After a slight fall in the velocity coefficient value during the first 5 days, however, there was a gradual increase which became more rapid after the 10th day. This was presumably due to the onset of nitrification, the occurrence of which did not become apparent until more than 15 days had elapsed. (Kreager-FIRL)
W77-02373

POLYMERS CUT COST OF PHOSPHORUS REMOVAL,
Thomas (Frank A.) and Associates, Inc., Willoughby, Ohio.
T. G. Check.
Water and Wastes Engineering, Vol. 13, No. 8, p 23-24, August, 1976. 1 fig, 2 tab.

Descriptors: *Tertiary treatment, *Phosphorus, *Polymers, *Waste water treatment, *Feasibility studies, Pilot plants, Costs, Ions, Coagulation, Flocculation, Sludge, Ohio.

A pilot plant study at a tertiary waste water treatment plant was conducted to investigate the feasibility of substituting wet or dry anionic polymers for sodium aluminate in the phosphorus removal system. The purpose of sodium aluminate or polymer addition is to achieve secondary coagulation and subsequent flocculation. Both Calgon WT 3000 (a dry powder) and Nalco 7744B (a liquid polymer) proved to be effective polymers for achieving the above purpose, with phosphorus concentrations of less than 1.0 milligrams/liter being achieved. Solids carryover was 10 milligrams/liter. Each polymer also resulted in the production of less sludge, thus reducing sludge pumping and lagoon capacity requirements. Using bulk delivery chemical costs, the total expense per month for the dry and liquid polymers is $80 and $116, respectivelyc as compared with $1100 for sodium aluminate. (Kreager-FIRL)
W77-02374

TOWARD A MORE MEANINGFUL INDEX OF SLUDGE QUALITY,
Carnegie-Mellon Univ., Pittsburgh, Pa.
For primary bibliographic entry see Field 5G.
W77-02378

INSTANTANEOUS METERING AIDS - ACTIVATED SLUDGE PLANT,
Suffolk County Dept. of Environmental Control, Hauppauge, N. Y. Operations Div.
For primary bibliographic entry see Field 5A.
W77-02381

ALARM SYSTEM CONTINUALLY MONITORS PLANT FUNCTIONS,
For primary bibliographic entry see Field 8C.
W77-02382

THEORETICAL MODEL FOR A SUBMERGED BIOLOGICAL FILTER,
Clarkson Coll. of Technology, Potsdam, N. Y. Dept. of Civil and Environmental Engineering.
P. A. Jennings, V. L. Snoeyink, and E. S. K. Chian.
Biotechnology and Bioengineering, Vol. 18, No. 9, p 1249-1273, September, 1976. 12 fig, 2 tab, 16 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Mathematical models, *Kinetics, *Liquid wastes, Waste treatment, Equations, Surfaces, Model studies, *Filters.
Identifiers: *Biological filters.

A mathematical model for describing the biological removal of a single substrate from waste water in a porous bed of biolayer coated particles assuming plug flow and steady-state conditions is described. The model uses the nonlinear Monod expression for the substrate utilization rate. The approximation of this Monod expression by a first order rate expression yields accurate results for a much wider range of bulk concentrations than might be expected from inspection of the Monod half-velocity coefficient for a given substrate. Percent removal of substrate is a weak function of biolayer thickness when the thickness is greater than a rather small limiting value but is a strong function of particle radius (and thus biolayer surface area) for a wide range of parameter values including those of common interest. (Kreager-FIRL)
W77-02385

ENVIRONMENTAL IMPACTS OF LAND APPLICATION OF SLUDGE,
Metropolitan Sanitary District of Greater Chicago, Ill. Dept. of Research and Development.
D. R. Zenz, J. R. Peterson, D. L. Brooman, and C. Lue-Hing.
Journal Water Pollution Control Federation, Vol. 48, No. 10, p 2332-2342, October, 1976. 2 fig, 8 tab, 6 ref.

Descriptors: *Sludge disposal, *Soil amendments, *Reclamation, *Illinois, *Monitoring, Biochemical oxygen demand, Suspended solids, Coliforms, Surface water, Groundwater, Water quality, On-site investigations, Waste water treatment, Viruses, Fish, Metals, Recycling.
Identifiers: Land application, Fulton county(Ill), Chicago area(Ill).

The results of a 4-year environmental monitoring program conducted by the Metropolitan Sanitary District of Greater Chicago to determine the effects of land application of sludge in Fulton County are reported. Surface discharges from fields receiving digested sludge averaged suspended solids, biochemical oxygen demand, and fecal coliform levels of 60 milligrams/liter, 6.0 milligrams/liter, and 36 counts/100 milliliters (geometric means), respectively. The water quality of a major stream which drains the digested sludge application project was unaffected by surface water discharges, and groundwater monitoring wells showed no evidence of groundwater contamination. After 3 years of sludge application, metal levels in corn grain grown on digested sludge amended soils showed no significant increase. Virus levels monitored over a 2-year period at three surface water monitoring points were not influenced by sludge application to the surrounding watershed. Fish living in several reservoirs which receive discharges from fields to which digested sludge has been applied were not influenced by such applications. (Kreager-FIRL)
W77-02391

A STUDY OF BACTERIAL AEROSOLS AT A WASTEWATER IRRIGATION SITE,
Army Medical Bioengineering Research and Development Lab., Frederick, Md.
For primary bibliographic entry see Field 5A.
W77-02392

LANDFILL MANAGEMENT WITH LEACHATE RECYCLE AND TREATMENT: AN OVERVIEW,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
F. G. Pohland.
In: Symposium on Gas and Leachate from Landfills: Formation, Collection, and Treatment, March 25-26, 1975, New Brunswick, New Jersey, Department of Environmental Science, Rutgers University, p 159-167. 9 fig, 2 tab, 3 ref.

Descriptors: *Leachate, *Landfills, *Waste disposal, *Waste treatment, *Recycling, Organic compounds, Methane, Biological treatment, Adsorption, Ion exchange, Inorganic compounds, Simulation analysis, Efficiencies.

An overview of a leachate recycle/treatment concept is presented based on experiments with a simulated landfill constructed so that leachate could be recycled back in a manner analogous to the operation of an anaerobic trickling filter. Recirculation of leachate through the landfill promotes a more rapid development of anaerobic activity and methane fermentation, an increase in the rate and predictability of biological stabilization of organic pollutants in the waste, a significant decrease in the time required for stabilization, and a reduction of the potential for environmental impairment. Leachate recirculation with pH control and initial sludge seeding further enhances treatment efficiency so that the time required for biological stabilization of readily available organic pollutants in the leachate is reduced to months rather than years. The application of separate anaerobic and aerobic biological processes has also proven satisfactory for leachate treatment. Carbon adsorption is effective in removing residual organics and inorganics in the effluent when it is followed by mixed resin ion exchange. (See also W77-02394) (Kreager-FIRL)
W77-02411

SOLID WASTE DEGRADATION DUE TO SHREDDING AND SLUDGE ADDITION,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5E.
W77-02412

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: CANE SUGAR REFINING,
Development Planning and Research Associates, Inc., Manhattan, Kans.
M. L. David, and R. J. Buzenberg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 599, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA-230/2-75-003, November 1975. 109 p. 2 fig., 34 tab. 68-01-1533.

Descriptors: *Economic impact, *Standards, *Water pollution control, *Effluents, *Sugar cane, Prices, Costs, Employment, Social impact, Industrial production, Foreign trade, Pollution abatement, Pricing, Industrial plants, Industrial wastes, Profits.
Identifiers: *Cane sugar refining industry, *Effluent guidelines, Plant closures.

This study supplements the EPA Effluent Limitation Guidelines analysis for the cane sugar refining industry by estimating the broader economic effects, such as price increases, effects on employment, foreign trade implications, and plant closures, which might result from application of pollution control technologies. Though all but 3 of the

29 refineries are over 50 years old, all are well maintainedand technologically up-to-date. Imposition of effluent limitation standards are not expected to raise prices, though they will have a negative impact on the already weak profit structure of the industry. It is estimated that 7% of the plants with 5% of industry capacity will become marginal and 10% of the plants with 6% of industry capacity will probably close, as a result. Three to five small, rural communities, whose economic life is considerably dependent upon a cane sugar refinery and the related activities of area sugar cane growers and mills, will be significantly affected by these closures. Balance of payments effects will be felt to the degree that imported raw sugar was utilized and resulted in refined sugar exportation, and to the degree that such production losses will be affected by the increased use of substites. Compensatory actions of the Secretary of Agriculture will also be a very significant.factor. (Luedtke-Wisconsin)
W77-02414

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE FABRICATED AND RECLAIMED RUBBER SEGMENT OF THE RUBBER PROCESSING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D. C. Effuent Guidelines Div.
R. J. Kinch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-241 916, Price codes: A11 in paper copy, A01 in microfiche. Report No. EPA-440/1-74-030-a, December 1974. 249 p. 12 fig., 44 tab., 28 ref.

Descriptors: *Industrial wastes, *Technology, *Standards, *Effluents, *Waste water treatment, Economic impact, Capital costs, Annual costs, Pollution abatement, Federal Water Pollution Control Act, Water reuse, Recycling, Pollutants, Industries, Treatment facilities.
Identifiers: *Rubber processing industry, *Effluent guidelines.

Effluent limitation guidelines and new source performance standards for the fabricated and reclaimed rubber segment of the rubber processing industry to be achieved by July 1, 1977 and July 1, 1983 were developed. The industry is categorized by three major groups: (1) general molded, extruded, and fabricated products, (2) wet digestion, pan, dry digestion, and mechanical reclaimed rubber, and (3) latex-based products. This breakdown has been further subcategorized into seven subcategories on the basis of the manufacturing processes characteristics involved. Facility size, process waste water flow rates and loadings, costs of control technologies, final product, raw materials, plant age, geographical location, air pollution equipment, and the nature and treatability of waste waters using biological and physical/chemical treatment systems were considered. General molded, extruded, and fabricated rubber plant wastes should be treated for suspended solids, oil and grease, lead, and pH. BPCTCA, BATEA, and NSPS are equivalent for this group excet for an allowance for wet scrubbers. Incremental treatment costs to the small and medium size plants in this group are high. Reclaimed rubber plant waste waters are contaminated with BOD, COD, suspended solids, oil, and acidity/alkalinity, while latex product waste waters must be treated for BOD, suspended solids, oil, chromium or zinc, and pH. (Luedtke-Wisconsin)
W77-02415

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE FORMULATED FERTILIZER SEGMENT OF THE FERTILIZER MANUFACTURING, POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
E. E. Martin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-240 863, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA 440/1-75-042-a, January 1975. 79 p. 11 fig., 2 tab., 24 ref.

Descriptors: *Fertilizers, *Industrial wastes, *Standards, *Effluents, Ammonium compounds, Pollution abatement, Water pollution control, Waste water treatment, Water reuse, Recycling, Federal Water Pollution Control Act, Technology, Economic impact, Industrial plants, Costs.
Identifiers: *Zero discharge, *Effluent guidelines, Ammonium sulfate.

Effluent limitation guidelines and new source performance standards for the ammonium sulfate and mixed and blended segment of the fertilizer industry to be achieved by July 1, 1977 and July 1, 1983 were developed. Synthetic and coke oven by-product production of ammonium sulfate are included. The mixed and blended fertilizers group represent by far the largest number of individual process plants in the overall fertilizer category. Use of treatment technologies such as manufacturing process control, recycle water systems, recovery and reuse of waste water, and dry collectors for air borne solids, which are currently utilized by better plants, make the recommended best practicable control technology currently available, the best available technology economically achieveable, and the new source performance standards identical and capable of zero discharge of process waste water pollutants to navigable waters. Factors considered in the analysis included total cost of technology application, size and age of facilities and equipment, the process employed, engineering aspects of control technology application, process changes, and ambient environmental impact including energy requirements. (Luedtke-Wisconsin).
W77-02419

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE PRIMARY ALUMINUM SMELTING SUBCATEGORY OF THE ALUMINUM SEGMENT OF THE NONFERROUS METALS MANUFACTURING, POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D. C. Effluent Guidelines Div.
G. S. Thompson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-240 859, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-440/1-74-019-D, March 1974. 150 p. 17 fig, 10 tab, 11 ref.

Descriptors: *Industrial wastes, *Aluminum, *Standards, *Technology, *Effluents, Capital costs, Operating costs, Pollution abatement, Water pollution control, Federal Water Pollution Control Act, Economic impact, Water reuse, Wastes water treatment, Industries.
Identifiers: *Effluent guidelines, Primary aluminum smelting.

Effluent limitation guidelines and standards of performance for the primary aluminum smelting industry to be achieved by July 1, 1977 and July 1, 1983 were developed. The best practicable control technology currently available (BPCTCA) is treatment of wet scrubber water and other effluents to precipitate the fluorides, to decrease the concentration of suspended solids, and to allow recycling of the treated water. Further lime treatment of bleed streams and filtrates constitutes the best available technology economically achievable. The best available demonstrated control technology consists of dry scrubbing of potline air and the control and treatment of other fluoride-containing waste streams by recycling and treatment of bleed streams by lime precipitation. Approximately one-third of the 31 primary aluminum plants have met the 1977 guidelines. The remainder of the industry can achieve these standards by application of the BPCTCA at an estimated capital investment of about $10/annual metric ton and an increased operating cost of about $4.6/metric ton. It is estimated that an additional investment of $3.8/annual metric ton and an operating cost of $1.13/metric ton would be required to decrease pollutant discharges to the 1983 level. (Luedtke-Wisconsin)
W77-02421

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE PHOSPHORUS DERIVED CHEMICALS SEGMENT OF THE PHOSPHATE MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W77-02431

ENVIRONMENTAL TRUST FUNDS: AN EVALUATION,
RIVUS, Inc., Glen Burnie, Md.
For primary bibliographic entry see Field 5G.
W77-02432

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES FOR SEAFOOD PROCESSING INDUSTRY: (FISH MEAL, SALMON, BOTTOM FISH, CLAMS, OYSTERS, SARDINES, SCALLOPS, HERRING, ABALONE),
Development Planning and Research Associates, Inc., Manhattan, Kans.
D. L. Jordening, and T. R. Eystone.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-247 307, Price codes: A09 in paper copy, A01 in microfiche. Report No. EPA-230/2-74-047, October 1975. 180 p. 80 tab. 68-01-1533.

Descriptors: *Economic impact, *Standards, *Water pollution control, *Effluents, *Food processing industry, Clams, Oysters, Salmon, Bottom fish, Industrial wastes, Industrial plants, Industrial production, Social impact, Employment, Prices, Pricing, Costs, Profits, Investment, Herrings, Pollution abatement, Foreign trade.
Identifiers: *Seafood processing industry, *Effluent guidelines, Fish meal, Menhaden, Anchovy, Sardines, Scallops, Abalone, Plant closures.

This study supplements the EPA Effluent Limitation Guidelines analysis for seafood processing industry by estimating the broader economic effects of the application of required pollution control technology. The seafood industry is characterized by a large number of small plants (726), decreases in the number of plants over time, and important competition from foreign producers. Economies of scale exist, both in processing and in effluent treatment. Opportunities to pass on total increased costs of $5,541,000 for BPT Standards and $11,157,000 for BPT plus BAT standards are limited because of the intense competitiveness of the industry. Plant closure impacts are expected to be greatest in the Alaskan salmon industry, non-mechanized bottom fish processing and clam processing, and the West Coast oyster industry. It is estimated that meeting BPT guidelines would close 42 plants and complying with BAT guidelines would close an additional 86 plants. Production impacts would be minimal since most of the closures would be small plants and the remaining plants have excess capacity. Good reemployment opportunities exist within the industry and net unemployment from BPT is estimated at 190 or 510 from BPT plus BAT. New Source Performance Standards will not curtail new investment in the industry. (Luedtke-Wisconsin)
W77-02433

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: BEET SUGAR INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
M. L. David, R. J. Buzenberg, and C. C. Jones.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 844, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA 230/2-75-002, August 1975. 128 p. 5 fig., 35 tab. 68-01-1533.

Descriptors: *Economic impact, *Standards, *Water pollution control, *Effluents, Prices, Employment, Costs, Social impact, Industrial production, Foreign trade, Industrial wastes, Pollution abatement, Industrial plants, Pricing, Profits.
Identifiers: *Beet sugar industry, *Effluent guidelines, Zero discharge, Plant closures.

This study supplements the EPA Effluent Limitation Guidelines analysis for the beet sugar industry by estimating the broader economic effects of the application of certain of these control technologies. Following a description of the number, types, size, and location of plants, financial profiles of representative model plants, pricing practices, and supply/demand relationships in the industry, pollution control costs are superimposed on the model plant financial profiles to analyze microeconomic effects such as unit cost increments, price increases, and potential closures. The macroanalysis effects on employment, communities, and foreign trade are also evaluated. Imposition of effluent limitation standards is not expected to raise prices because large portions of industry are already at or very near zero discharge levels. Potential closures due to imposition of zero discharge standards are estimated to be 7 to 17 plants representing between 8% and 26% of beet sugar production. A discharge standard of .5 pounds of BOD in 1977 is estimated to cause 4 to 10 plant closures. New plants are expected to come on line to offset nearly all of these potential closures. While employment effects are expected to be minimal, the effects on a given community could be greater due to the loss of growers, since each plant represents about 300 growers. (Luedtke-Wisconsin)
W77-02434

REMOVAL BENEFITS: IT CAN BE TOO COSTLY,
Kansas City Water Dept., Mo.
D. R. Boyd, J. R. Popalisky, J. D. Reece, and D. McMurtrey.
Water and Waste Engineering, Vol. 13, No. 2, p 42-44, 1976. 4 fig.

Descriptors: *Analytical techniques, *Organoleptic properties, *Nutrient removal, *Waste water treatment, *Water treatment, Missouri River, Agricultural runoff, Treatment facilities, Comparative benefits.
Identifiers: Non-point pollution sources, Kansas City(Mo).

The case against requiring complete nutrient removal at sewage treatment facilities discharging into the Missouri River with particular reference to Kansas City, Missouri, is described. Based on current minimum flows for the Missouri River, the quantity of the effluent discharged from Kansas City, never exceeds 1% of the river's flow. Ninety-five percent of the sewage is discharged directly into the river after primary treatment, while the remainder undergoes secondary treatment before being discharged. In addition, land use in the drainage area is predominantly agricultural and produces much nutrient enrichment in the form of decayed matter, animal wastes, and fertilizers. Because of these factors, sewage wastes from point sources are of comparatively minor significance and advanced waste treatment facilities at Kansas City would have an insignificant effect on the water quality in the receiving stream. The incidence of organoleptic properties in the Kansas City's water supply generated an analytical procedure for determining the relative amounts and general classification of the agricultural problem organics. The procedure involves sample concentration followed by detection using gas chromatography and infrared spectrometry. A schematic diagram represents the procedure. The method is used as an integral part of the water treatment plant's daily operation and was the basis for plant modification to remove turbidity and organics. (Luedtke-Wisconsin)
W77-02436

KINETICS OF THE ACTIVATED CARBON-STEAM REACTION,
Connecticut Univ., Storrs. Dept. of Chemical Engineering.
H. E. Klei, J. Sahagian, and D. W. Sundstrom.
Industrial and Engineering Chemistry, Process Design and Development, Vol 14, p 470, October 1975. 5 fig, 1 tab, 12 ref. OWRT A-045-CONN(2), 14-31-0001-3807.

Descriptors: *Activated carbon, *Kinetics, *Waste water treatment, *Water pollution, Adsorption, Heat transfer.
Identifiers: *Thermal regeneration, *Carbon-steam reaction, Gas-flow rate, External mass transfer rate.

A bed of activated carbon was reacted with steam at temperatures between 1400 and 1500F and steam concentrations between 10.7 and 53.4 mol % to determine the kinetic rate equations which predict the reaction rate. In addition, since activated carbon is a porous solid, the effect of gas flow rate through the bed was studied to see if mass transfer was important. The reaction rate was found to vary with the 0.58 power on the steam concentration with an activation energy of 63.6 kcal/g-mol. The gas rate did have some effect on the reaction rate but it appeared not to be sufficient to shift the controlling step to mass transfer. (de Lara-Connecticut)
W77-02519

REMOVAL OF ALGAE FROM FLORIDA LAKES BY MAGNETIC FILTRATION,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
G. Bitton, J. L. Fox, and H. G. Strickland.
Applied Microbiology, Vol. 30, No. 6, p 905-908, December 1975. 2 fig, 3 tab, 16 ref. OWRT A-030-FLA(1). 14-31-0001-5009.

Descriptors: *Viruses, Filtration, *Florida, Lakes, Waste water treatment, Algae, Hydrogen ion concentration.
Identifiers: *Magnetic filtration.

Magnetic filtration was used for the removal of algal populations present in five lakes located in the vicinity of Gainesville, Florida. It was found that the use of this technique enabled a good removal (94%) of algal cells from three lakes where the pH was around 7. The other two lakes, with a higher pH, displayed a lower removal. However, the treatment was greatly improved by lowering the pH from 9.5 to 6.5. (Morgan-Florida)
W77-02522

A SENSITIVE ALGAL ASSAY: AN IMPROVED METHOD FOR ANALYSIS OF FRESHWATERS,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5A.
W77-02524

DISTRIBUTION OF AQUATIC YEASTS - EFFECT OF INCUBATION TEMPERATURE AND CHLORAMPHENICOL CONCENTRATION ON ISOLATION,
Connecticut Univ., Noank. Marine Research Lab.
For primary bibliographic entry see Field 5A.
W77-02525

FACTORS AFFECTING THE ADSORPTION OF POLIO VIRUS TO MAGNETITE IN WATER AND WASTEWATER,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
G. Bitton, O. Pancorbo, and G. E. Gifford.
Water Research, Vol. 10, p 978-980, 1976. 5 fig, 7 tab, 22 ref. OWRT A-030-FLA(2). 14-31-0001-5009. 14-34-0001-6010.

Descriptors: *Viruses, *Filtration, Adsorption, *Waste water treatment.
Identifiers: *Magnetic filtration, *Polio virus, *Magnetite, *Virus removal.

The process of magnetic filtration involves the use of magnetite for the removal of various pollutants from water and wastewater. A study was undertaken to investigate the interaction between magnetite and polio virus. It was found that the adsorption process was enhanced by the presence of cations, conformed to the Freundich isotherm, and did not vary significantly when the pH was varied from 5 to 9. The influence of two wastewater effluents on the adsorption process was also studied and their interference with the adsorption of polio virus to magnetite is discussed. (Morgan-Florida)
W77-02530

USE OF WASTE HEAT FOR SOIL WARMING IN NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
R. W. Skaggs, D. C. Sanders, and C. R. Willey.
Reprint from Transactions of the ASAE, Vol. 19, No. 1, p. 159-167, 1976. OWRT A-060-NC(4). 14-31-0001-3833.

Descriptors: *Heat transfer, Surface irrigation, Subsurface irrigation, *Cooling water, *Heated water, Soil temperature, Southeast U.S., Horticultural crops, Electric power, Thermal pollution, *North Carolina.
Identifiers: *Soil warming, *Waste heat.

In field experiments conducted to evaluate the use of waste heat for soil warming in the Southeast, water was heated to 37.7C and circulated through a network of underground plastic pipes. Soil temperature and heat flux measurements were analyzed to determine the effect of soil warming in combination with surface and subsurface irrigation on the soil temperature regime and on the amount of heat that can be transferred to the soil system. It was determined that heat could be transferred to the soil system at rates ranging from 37.5 w/m2 during hot periods to greater than 138 w/m2 during cold periods. Soil warming increases surface temperatures sufficient to stimulate plant growth during cool seasons of the year. However, the temperature rise due to soil warming is somewhat less in hot periods. A mathematical model developed by Kendrick and Havens (1973) was used to extrapolate the information obtained in this study to prototype scale systems. It was determined from heat flux data that for hot summer days the effective surface temperature, approximately 6500 ha would be required to handle the waste heat from a 1000 megawatt plant if the soil warming system consists of 10 cm pipe buried 50 cm deep and placed 50 cm apart. If low volume sprinkler irrigation is used in combination with sub-surface irrigation, the effective surface temperature can be reduced to 27C and about 4900 ha would be required. Based on these projections and on an economic analysis of a soil warming system by Plummer (1974), it was concluded that soil warming systems will not be economically competitive with conventional cooling methods in N. C. at the present time. (Kiger-North Carolina)
W77-02532

SPRAY IRRIGATION OF WASTE WATER ON CITRUS GROVES,
Agricultural Research and Education Center, Lake Alfred, Fla.

R. C. J. Koo.
Reprint from Transactions of the 1976 Citrus Engineering Conference, American Society of Mechanical Engineers, Florida Section, Vol XXII, March 25, 1976. 14 p, 5 fig, 6 tab, 10 ref. OWRT A-016-FLA(1). 14-31-0001-3809.

Descriptors: *Citrus, Irrigation, Nutrients, Water pollution, Fruit crops, *Spray irrigation, *Water reuse.

Spray irrigation is widely used to dispose of the waste water from citrus processing plants. The citrus processing season in Florida may range from 6 to 10 months a year depending on the size and the type of the fruit crop. Much of this season occurs in that part of the year when rainfall is deficient. It would be advantageous if this waste water could be utilized in the production of citrus crops. A study was conducted between 1971 and 1974 to investigate the feasibility of growing citrus with citrus processing waste water. Design criteria and operational methods of spray irrigation with citrus processing waste water under Florida conditions have been reported by Morrell. Tree performance and certain horticultural considerations of spray irrigation of citrus with processing waste water are investigated. (Morgan-Florida)
W77-02544

RISK-SAFETY FACTOR RELATION FOR STORM SEWER DESIGN,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
B. C. Yen, and W. H. Tang.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 102, No. EE2, p 509-516, April, 1976. 3 fig, 1 tab, 9 ref, 2 append. OWRT C-4123(No. 9023) (7).

Descriptors: *Sewers, *Design criteria, *Risks, *Safety factors, *Storm drains, *Network design, *Pipes, Slopes, Equations, Rainfall intensity, Watersheds(Basins), Discharge(Water), Curves, Waste water treatment.
Identifiers: *Storm sewers, Pipe diameter, Sewer capacity.

A new method has been proposed for optimal design of diameters and slopes of pipes of storm sewer networks. The basic equations involved are introduced. The four parameters contributing to the uncertainty in the sewer capacity are evaluated. This uncertainty results from uncertainties in hydraulic radius, resistance coefficient, slope, and equation error. The uncertainty of rainfall intensity varies with the design return period and the duration of the rainfall and the location and size of the drainage basin. A 10-acre drainage basin at Urbana, Illinois is considered as an example. The uncertainties in runoff coefficient, area, and equation error must also be known to determine the uncertainty in design discharge. A risk-safety factor curve can be constructed by calculating corresponding risks and safety factors for various pipe sizes with other conditions unchanged, and repeating the procedure for a different duration. Different curves should be used for different locations, because spatial variations of rainfall and surface slope will cause the curves to vary. (Snyder-FIRL)
W77-02551

THE ROLE OF SOLAR ULTRAVIOLET RADIATION IN 'NATURAL' WATER PURIFICATION,
Kentucky Univ., Lexington. Dept. of Radiation Medicine.
J. Calkins, J. D. Buckles, and J. R. Moeller.
Photochemistry and Photobiology, Vol. 24, No. 1, p 49-57, July, 1976. 7 fig, 2 tab, 24 ref. OWRT A-064-KY(1).

Descriptors: *Water purification, *Coliforms, *Solar radiation, *Waste water treatment, *Tertiary treatment, Lagoons, Bacteria, Bactericides, Microorganisms, Mortality, Monitoring, E. coli.

The effect of solar ultraviolet radiation on natural water purification was investigated by monitoring the concentration of Escherichia coli in the input and output of a tertiary waste water system (four lagoons) over an 11-month period and by measuring the integrated flux of biologically active solar ultraviolet radiation. A comparison of the die-off expected from solar ultraviolet exposure to the actual die-off observed for different batches of water was obtained by also determining the effective temperature of the system, the growth rate of Escherichia coli at the effective temperature, the penetration of solar ultraviolet radiation into the lagoons, the dose-response relation for the killing of Escherichia coli by ultraviolet radiation, and the retention time of water in the system. The observed killing of Escherichia coli was quite close to the values calculated, and solar ultraviolet radiation appears to be a very important factor in the natural purification of water. (Kreager-FIRL)
W77-02552

ENVIRONMENTAL ASPECTS OF CHEMICAL USE IN PRINTING OPERATIONS, (SEPTEMBER 22-24, 1975, KING OF PRUSSIA, PA.), CONFERENCE PROCEEDINGS.
Environmental Protection Agency, Washington, D. C. Office of Toxic Substances.
For primary bibliographic entry see Field 5C.
W77-02553

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE PLYWOOD, HARDBOARD AND WOOD PRESERVING SEGMENT OF THE TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D. C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W77-02554

HYPERFILTRATION FOR RENOVATION OF TEXTILE FINISHING PLANT WASTEWATER,
La France Industries, S. C.
C. A. Brandon, and J. J. Porter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 188, Price codes: A08 in paper copy, A01 in microfiche. Report EPA-600/2-76-060, March 1976, 157 p, 15 fig, 8 ref, 23 tab, 3 append.

Descriptors: *Textiles, *Waste water treatment, *Water reuse, Wastes, Industrial wastes, Water pollution sources, Waste treatment, Dyes, Membrane processes, Costs, Water conservation, *Recycling, *Filtration, Waste water(Pollution), Water pollution treatment, Water pollution control.
Identifiers: *Hyperfiltration.

Experimental studies show that waste water from a textile dyeing and finishing operation can be recycled. The waste water was run through a set of hyperfiltration membranes, which separated it into purified water and a concentrated dye residue fraction. Over a 15-month period, up to 90% of the waste water was recovered and used as the normal supply in all parts of the dyeing operation. The concentrated dye residue can also be used to dye fabric. The cost of recycling the waste water was projected to be $0.121/cu m of waste water. However, reusing the waste water results in savings of $0.234/cu m, due to savings in water, chemicals, and energy. (Witt-IPC)
W77-02557

ORGANIC COMPOUNDS IN PULP MILL LAGOON DISCHARGE,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 5A.
W77-02558

CHLORIDES IN THE KRAFT RECOVERY SYSTEM. I. CHLORIDES IN THE RECOVERY BOILER, AND A MECHANISM FOR CHLORIDE REMOVAL,
Swedish Forest Products Research Lab., Stockholm.
B. Warnqvist, and H. Norrstrom.
TAPPI/CPPA International Pulp Bleaching Conference, Chicago, May 2-6, 1976, Preprinted Proceedings (TAPPI, Atlanta, Ga.), p 13-18. 10 fig, 9 ref.

Descriptors: *Bleaching wastes, *Water reuse, Pollution abatement, Pulp and paper industry, Water pollution sources, Wastes, Industrial wastes, Recycling, Water pollution control, Chlorides, Chemical reactions, Fly ash, Sodium chloride, Operation and maintenance, Water conservation, Effluents.
Identifiers: *Kraft mills, Recovery furnaces, Hydrogen chloride, Flue gases, Gas scrubbing.

One possible way to reduce the discharge of water pollutants from kraft pulp bleaching is to recycle effluent streams from the bleach plant to the recovery system. This raises questions concerning the effects of increased chloride levels in the liquor cycle and the removal of chloride from the recovery system. The distribution of chlorides between the smelt and the gas phase in the recovery furnace has been determined in mill trials and correlated with a theoretical chemical process model. The reaction equation given can be used to convert NaCl in the flue gas dust (fly ash) from the recovery furnace into gaseous HCl. The HCl produced can be removed by scrubbing the flue gas with water. Melting point data for chloride-containing smelts were determined by laboratory studies on the model system NACL-sodium carbonate-sodium sulfide. The implications of these studies on the operating conditions of the recovery furnace are discussed. (See also W77-02560) (Witt-IPC)
W77-02559

CHLORIDES IN THE KRAFT RECOVERY SYSTEM. II. PROCESS AND EQUIPMENT ASPECTS ON A CLOSED BLEACHED KRAFT MILL,
Finnish Pulp and Paper Research Inst., Helsinki.
P.-E. Ahlers, H. Norrstrom, and B. Warnqvist.
TAPPI/CPPA International Pulp Bleaching Conference, Chicago, May 2-6, 1976, Preprinted Proceedings (TAPPI, Atlanta, GA.), p 19-25. 9 fig, 29 ref, 3 tab.

Descriptors: *Bleaching wastes, *Water reuse, Wastes, Industrial wastes, Water pollution sources, *Recycling, *Chlorides, Corrosion, Steel, Alloys, Water pollution control, Closed systems, Effluents, Pulp and paper industry, Pollution abatement, Titanium, Oxygen.
Identifiers: *Kraft mills, Bleach plants, Delignification, Oxygen bleaching, Chlorine dioxide, Closed systems.

Recycling bleach plant effluent to the recovery system reduces the amount of water pollutants from a bleached kraft pulp mill. Several methods of removing chlorides from a mill with a closed bleachery are under development. Extended delignification in the cook, oxygen bleaching, and the use of a high proportion of chlorine dioxide during bleaching will help to keep chloride levels low. Chloride concentrations of 20-30 g NaCl/liter of white liquor have a slightly negative effect on pulp (this may be offset by increasing the sulfidity) but show no adverse effects on bleached pulp strength or brightness stability. Increases in recovery system corrosion are indicated. Only highly alloyed steels with a molybdenum content of more than 4% show fair stability in the first bleach stage; however, only titanium can be used with certainty in this corrosive environment. High-grade alloys must be used elsewhere in the bleach plant. (See also W77-02559) (Witt-IPC)
W77-02560

EFFLUENT-FREE BLEACHED KRAFT PULP MILL. VIII. BLEACH PLANT RENOVATION AND DESIGN,
Erco Envirotech Ltd., Toronto (Ontario).
D. W. Reeve, G. Rowlandson, and W. H. Rapson.
TAPPI/CPPA International Pulp Bleaching Conference, Chicago, May 2-6, 1976, Preprinted Proceedings (TAPPI, Atlanta, Ga.), p 117-125. 5 fig, 14 ref.

Descriptors: *Bleaching wastes, *Water reuse, Pollution abatement, Effluents, Wastes, Industrial wastes, Pulp wastes, Water pollution sources, *Recycling, *Design, Temperature, Chlorine, Water pollution control, Reclaimed water, Water conservation, Pulp and paper industry.
Identifiers: *Kraft mills, Bleach plants, Countercurrent washing, Pulp washing, Chlorine dioxide, Sodium hypochlorite.

Renovation programs in two existing kraft mills demonstrate that increased water reuse and recycle within conventional bleach plants can reduce steam and fresh water consumption and effluent volume. Recycle of the chlorination filtrate increases the temperature of the first stage, and with proper automatic control can result in substantial chemical savings with no loss in pulp strength or quality. Substantial steam savings result from implementation of complete countercurrent washing in both CEDED and CEHDED bleach plants. Several design features are recommended to prevent increased chemical consumption. The design for new kraft bleach plants incorporated not only chlorination filtrate recycle and complete countercurrent washing, but many other steam and water saving features. Fresh water addition to seal tanks, for pulp doctoring, and pump glands is minimized. All the oxidizing chemical required in the 70/30 D/C-EDED bleach plant, as chlorine dioxide, chlorine, and NaOCl, can be supplied by the chlorine dioxide generator, eliminating use of gaseous chlorine and minimizing water input. Seal tanks are specially designed to prevent foaming. Kraft bleach plants can be designed and operated so that only 4,000 U.S. gallons total filtrate is produced per ton of pulp. Filtrates from the first and second stages are used separately, in brown stock washing and in preparation of cooking liquor. All the bleach plant filtrate can be recovered and the last major source of water pollution from bleached kraft pulp mills eliminated. (See also W76-11382; W74-07379 and W74-05275) (Witt-IPC)
W77-02562

INVESTIGATIONS OF EFFLUENT CHARACTERISTICS FROM CONVENTIONAL AND OXYGEN BLEACHING SEQUENCES: RESULTS OF LABORATORY STUDIES,
National Council of the Pulp and Paper Industry for Air and Stream Improvement, Inc., Gainesville, Fla.
W. L. Carpenter, W. T. McKean, H. F. Berger, and I. Gellman.
TAPPI/CPPA International Pulp Bleaching Conference, Chicago, May 2-6, 1976, Preprinted Proceedings (TAPPI, Atlanta, Ga.), p 111-115. 18 ref, 5 tab.

Descriptors: *Bleaching wastes, Effluents, Wastes, Industrial wastes, Water pollution sources, Softwood, Hardwood, Color, Biochemical oxygen demand, Chemical oxygen demand, Chlorides, *Waste water treatment, Water pollution treatment, Aeration, Oxidation lagoons, Waste treatment, Pulp and paper industry, Pollution abatement.
Identifiers: *Oxygen bleaching, Kraft pulps, Sulfite pulps.

Effluents from the laboratory bleaching of kraft softwood, hardwood, and sulfite pulps by conventional sequences (CEHDED and CEH) and by oxygen sequences (OCEDED, OCED, COD, CODED, and D/COD) are compared. The reductions in color, BOD, chemical oxygen demand, chloride, and total, volatile, and fixed solids were 99, 39, 89, 51, 74, 60, and 87%, respectively, on switching from CEH to OC sequences. Reductions were 60, 50, 33, 62, 0, 24, and 0%, respectively, using a CO sequence. Information on laboratory bleaching conditions employed is detailed, including temperature, time, pulp consistency, chemical charge, oxygen pressure, and volume of wash water. Data on final pulp brightness and kappa-number are presented. Laboratory studies on treatment of the effluents in an aerated stabilization basin are described, showing reductions in BOD of 90% with 4 days aeration. (Witt-IPC)
W77-02563

NEW BIOLOGICAL CLARIFIER OF THE WIESLOCH PAPER MILL OF HOLFELDER-WERKE GMBH. UND CO. KG. (NEUE BIOLOGISCHE KLAERANLAGE DER PAPIER-FABRIK WIESLOCH DER HOLFELDER-WERKE GMBH UND CO. KG.),
H. L. Dalpke.
Wochenblatt fuer Papierfabrikation, Vol. 104, No. 18, p 701, 703, September 30, 1976. 2 illus.

Descriptors: *Pulp wastes, *Waste water treatment, *Biological treatment, Wastes, Waste treatment, Industrial wastes, Water pollution treatment, Water pollution sources, Biochemical oxygen demand, Chemical oxygen demand, Foreign countries, Europe.
Identifiers: Germany.

A brief description is given of a new biological clarifier installation, using the two-stage Attisholz process. BOD was reduced from 1200 mg to 10 mg oxygen/liter. Corresponding values for COD were 1800 and 100, respectively. (Ward-IPC)
W77-02566

NEW CLARIFIER INSTALLATION FOR ALBBRUCK PAPER MILL (NEUE KLAERANLAGE DER PAPIERFABRIK ALBBRUCK).
Wochenblatt fuer Papierfabrikation, Vol. 104, No. 17, p 663, 665, September 15, 1976. 5 fig, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution control, Water pollution sources, Neutralization, Flocculation, Sludge treatment, Dewatering, Sludge disposal, Pulp and paper industry, Europe.
Identifiers: Rhine River(Germany), White water(Paper machines), Germany.

The mill's new effluent treatment system (for white water from 5 fine-paper machines and one coating machine) is briefly described. The system includes neutralization, sludge-contact-flocculation, sludge-thickening, and sludge-dewatering stages. The clarified water has a maximum solids content of 20 g/liter and is discharged into the Rhine River. The dewatered sludge is suitable for dumping. (Speckhard-IPC)
W77-02567

ENVIRONMENTAL PROTECTION IN THE PULP AND PAPER INDUSTRY, POSSIBILITIES OF REALIZATION AND PRESENT STATE OF TECHNOLOGY (UMWELTSCHUTZ IN DER ZELLSTOFF- UND PAPIERINDUSTRIE, MOEGLICHKEITEN DER REALISIERUNG UND HEUTIGER STAND DER TECHNIK),
Cellulose Attisholz A. G. (Switzerland).
A. Scherler.
Wochenblatt fuer Papierfabrikation, Vol. 104, No. 17, p 613-618, 620, September 15, 1976. 4 fig, 12 tab.

Descriptors: *Pulp wastes, *Waste water treatment, Treatment facilities, Effluents, Pulp and paper industry, *Biological treatment, *Activated carbon, Water pollution sources, Water pollution treatment, Wastes, Industrial wastes, Carbon, Organic compounds, Pollution abatement.

Topics discussed are the composition of effluents, the special problems of pulp mill waste waters and the consequences for the pulp industry, differences between pulp and paper mill treatments of wastes, special problems of paper mill waste waters and consequences for the paper industry, and some experimental results on effluents from 10 paper mills and 4 board mills. The effluent testing involved biological clarification and activated carbon treatment of the clarified effluent and resulted in total organic carbon (TOC) reductions ranging from 89.6 to 97.9%. (Ward-IPC)
W77-02568

MODERN SEPARATION PROCESSES FOR ELIMINATING WASTE WATER AND SLUDGE PROBLEMS IN PULP AND PAPER MILLS (NEUZEITLICHE TRENNUNGSVERFAHREN ZUR BESEITIGUNG DES ABWASSER UND SCHLAMMPROBLEMES IN ZELLSTOFF- UND PAPIERFABRIKEN),
VIBCONSULT, Munich (Germany).
J. Bauer.
Wochenblatt fuer Papierfabrikation, Vol. 104, No. 17, p 632-635, 638-640, September 15, 1976. 9 fig, 2 illus, 10 ref, 4 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Reverse osmosis, *Sludge treatment, *Aeration, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Dewatering, Sludge, Membrane processes, Oxygenation, Waste treatment, Separation techniques.

The reverse osmosis process for effluent treatment and the Unox system for oxygen-activation of biological sludges are described. Various types of processes for dewatering primary and secondary sludges and mixtures are also compared. (Ward-IPC)
W77-02569

TREATMENT OF PAPERMAKING EFFLUENTS (TRAITEMENT D'EFFLUENTS DE PAPETERIES),
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
A. Wong, S. Prahacs, and J. Dorica.
French Patent No. 2,252,301, June 20, 1975. 16 p. 2 claims.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated carbon, *Patents, Wastes, Industrial wastes, Water pollution treatment, Water pollution control, Waste treatment, Coagulation, Flocculating, Sludge, Flotation, Centrifugation, Fly ash, Coals, Aeration.
Identifiers: Charcoal, Wood.

A process for purifying waste waters such as papermaking effluents involves the following operations: finely divided activated carbon is added to the waste water to form a suspension, an oxygen-containing gas (e.g., air) is passed through the suspension, a coagulating or flocculating agent or polyelectrolyte is added to form a sludge, and the sludge is separated by decantation, flotation, or centrifugation. In particular, the finely divided activated carbon has a specific surface of 100-1800 sq m/g and is derived from fly ash, wood carbonization residue, green liquor mud, wood charcoal, and/or bone coal. (Speckhard-IPC)
W77-02570

FIXED BIOLOGICAL SURFACES -- WASTEWATER TREATMENT: THE ROTATING BIOLOGICAL CONTRACTOR,
Autotrol Corp., Milwaukee, Wis.
R. L. Antonie.
CRC Press, Cleveland, Ohio. 1976. 200 p.

Descriptors: *Biological treatment, *Waste water treatment, *Pulp wastes, Wastes, Industrial wastes, Waste treatment, Treatment facilities, Suspended solids, History, Trickling filters,

Capital costs, Operating costs, Cost, Operation and maintenance, Sampling, Water analysis, Municipal wastes, Equipment, Water purification, Water pollution treatment.
Identifiers: *Rotating biological contactor.

The RBC process for secondary biological treatment of domestic waste waters and industrial effluents involves the use of large-diameter plastic media mounted on a horizontal shaft which rotates slowly in a concrete tank while about 40% of its surface area is submerged. The resulting accumulation of biomass in layers 1-4 mm thick, equivalent to 50,000-100,000 mg/liter suspended solids, permits intensive purification within fairly short retention times. This monograph deals with the history and development of the RBC process, the basic design and operating parameters of the contactor, and practical experience with its operation. In 10 chapters, the author discusses a wealth of details, such as the early trickling filter (fundamentals, history, problems, capital and operating costs); RBC system designs for domestic wastewater treatment and for treating various industrial wastes (such as pulp and paper mill discharges); the upgrading of existing treatment facilities (primary, trickling-filter, activated-sludge, and lagoon installations); equipment configurations and plant operation (startup, problem areas, maintenance, wastewater sampling and analysis); capital and operating costs (power consumption, comparison with activated sludge and other secondary treatment processes); and possible future developments. A subject index is appended, and literature citations are given after each chapter. (Brown-IPC)
W77-02571

C(ROWN) Z(ELLERBACH)'S SOLIDS WASTE PROBLEMS AT WAUNA ARE REDUCED BY COMPOSTING,
Crown Zellerbach Corp., Wauna, Oreg.
For primary bibliographic entry see Field 5E.
W77-02572

CARPET AND RUG INDUSTRY CASE STUDY I: WATER AND WASTEWATER TREATMENT PLANT OPERATION,
Georgia State Univ., Atlanta.
P. E. Gaffney.
Journal Water Pollution Control Federation, Vol. 48, No. 11, p 2590-2598, November, 1976. 7 ref, 7 tab.

Descriptors: *Textiles, *Water pollution sources, *Water treatment, *Waste water treatment, Georgia, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Operation and maintenance, Wastes, Industrial wastes, Treatment facilities, Polychlorinated biphenyls, Organic compounds.
Identifiers: Carpets, Rugs, Coosa River(Georgia), Chlorobenzenes, Halocarbons.

An investigation was conducted on water supplies and municipal waste waters in three northwest Georgia cities situated in the Coosa River basin. Streams and sewers receive significant discharges of textile (carpet and rug) processing chemicals. Determination was made of the concentrations of biphenyl, chlorobiphenyl, chlorobenzenes, and other substances at three water and four waste water treatment facilities in conjunction with other data (BOD, COD, suspended solids) relating to plant operation and performance. Two waste treatment plants were experiencing operating difficulties which may be related to the presence of textile-processing chemicals or substances formed after chlorination such as chlorobiphenyls or polychlorinated biphenyls. (Witt-IPC)
W77-02574

STUDY OF DEWATERING OF CELLULOSIC SLUDGE FROM THE VISCOSE FIBER INDUSTRY (ISSLEDOVANIE PO OBEZVOZHIVANIYU TSELLYULOZNOGO SHLAMA PREDPRIYATII VISKOZNOGO VOLOKNA),
Lvovskii Politekhnicheskii Institut (USSR).
A. A. Berlin, and E. I. Kuryatnikov.
Khimicheskaya Tekhnologiya, Vol. 87, No.3, p 47-48, May/June, 1976. 2 fig, 4 ref, 1 tab.

Descriptors: *Sludge disposal, *Dewatering, *Pulp wastes, *Cellulose, Filtration, Polymers, Aluminum, Sulfates, Water pollution sources, Wastes, Industrial wastes, Drainage, Waste disposal, Mixing, Sludge, Solid wastes, Water pollution control, Textiles.
Identifiers: *Viscose, Waste paper, Paper machines, Polyacrylamide, Polyethylene oxide.

After a discussion of the disadvantages of known methods (notably sludge accumulators, drainage beds, or centrifugation) for dewatering and disposal of sludges produced in the maufacture of viscose, the authors report results of experiments designed for dewatering blends of waste paper pulp plus cellulosic sludge by filtration on a paperboard machine at various degrees of freeness. Optimum freeness for the blend was determined to be between 25 and 40 Schopper-Riegler. The influence of drainage aids, viz., polyacrylamide (PAA), aluminum sulfate, and polyethylene oxide (PEO) on the freeness degree was also evaluated, with the following results: addition of 1.5% aluminum sulfate or 0.05% PAA (dry-weight basis) assures the effective lowering of the beating degree. However, the addition of 0.3-0.8% PEO (dry-weight basis) produced the best results and lowered the beating degree to a greater extent than did the other two coagulants added in optimal concentrations. Based on these findings, it is suggested that dehydration of a blend of waste paper pulp and cellulosic sludge obtained from the production of viscose can be carried out effectively on industrial board machines, provided the optimum ratio of components is maintained, preferably 3 parts waste paper pulp per part of cellulosic sludge. (Sykes-IPC)
W77-02575

5E. Ultimate Disposal Of Wastes

THE DESIGN AND CONSTRUCTION OF A SCREENING AND PUMPING STATION AND AN OUTFALL FOR THE DISPOSAL OF SEWAGE FROM BRIGHTON AND HOVE,
J. D. C. Osorio.
The Public Health Engineer, Vol 4, No 5, p 131-137, September, 1976. 4 fig, 6 ref.

Descriptors: *Pumping plants, *Screens, *Outlets, *Sewage disposal, *Treatment facilities, Equipment, Construction, Design criteria, Liquid wastes, Suspended solids, Waste water treatment, Waste disposal, Flow, Hydraulics, Municipal wastes.

Design and construction details of a screening and pumping station and an outfall for the disposal of sewage from Brighton and Hove (Great Britain) are described. The general scheme involves: an outfall long enough to ensure that sewage cannot reach the beach areas of the above communities until dilution and action of the sea water on sewage bacteria have reduced pollution to an acceptable level, pumps to allow the intercepting sewer to discharge freely at all times, and screens and ancillary equipment for the removal of sewage solids. The pumping and screening plant is designed for a 4000-liters/sec flow, and the outfall and diffuser system is designed to accept 6800 liters/sec, six times the anticipated average dry-weather flow. The screening plant should be capable of handling 2500 kg of dry solids/day. Screening are removed from the fine screens by water jets, and grit removal from tanks is by chain and bucket scrapers. The outfall tunnel is 2.3 meters in internal diameter and 1830 meters long and is lined with Kinnear Moodie Rapid smooth bore segments. infiltration of groundwater is controlled by injecting rapid hardening cement grout through holes drilled ahead of the face. (Kreager-FIRL)
W77-02331

DILUTION AND DESIGN,
Water Pollution Research Lab., Stevenage (England).
A. R. Agg.
Water and Waste Treatment, Vol 19, No 7, p 33, July, 1976. 2 fig, 1 ref.

Descriptors: *Outlets, *Design criteria, *Waste water disposal, *Conveyance structures, *Hydraulic structures, Mathematical models, Sewage disposal, Industrial wastes, Liquid wastes, Waste disposal.

A method for designing outfalls for the discharge of sewage or industrial wastes to the sea is described which is based primarily on initial dilution and the transit times from the outfall to the area of concern. The design procedure assumes a demand for very high initial dilution factors if the release is close to the beach and progressively lower demand factors as the outfall is extended offshore. The design length for the outfall is given by the intersection of a curve for the dilution which can be attained with the flow of sewage and depths of water with a curve representing the demand for dilution. Calculations based on the above design procedure indicate that a system with 10 outfalls reduces the length of the outfall required by about 50%. (Kreager-FIRL)
W77-02332

SPRAY IRRIGATION SOLVES DISPOSAL PROBLEM,
Van Note-Harvey Associates, Princeton, N.J.
For primary bibliographic entry see Field 5D.
W77-02356

RECOVERY AND REUSE OF ALUM FROM WATER FILTRATION PLANT SLUDGE BY ULTRAFILTRATION,
Massachusetts Univ., Amherst. Environmental Engineering.
For primary bibliographic entry see Field 5D.
W77-02371

SOYBEAN YIELD RESPONSES AND ASSIMILATION OF ZN AND CD FROM SEWAGE SLUDGE-AMENDED SOIL,
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W77-02377

MOVEMENT OF HEAVY METALS BELOW SEWAGE DISPOSAL PONDS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-02379

THE INFLUENCE OF HIGH QUANTITIES OF MANURE ON SOIL WATER, AND PLANTS, (IN GERMAN),
Agricultural Experiment Station, Oldenburg (West Germany).
For primary bibliographic entry see Field 5G.
W77-02387

CROP RESPONSE TO TANK TRUCK APPLICATION OF LIQUID SLUDGE,
Ball State Univ., Muncie, Ind. Dept. of Natural Resources.
For primary bibliographic entry see Field 5C.
W77-02390

ENVIRONMENTAL IMPACTS OF LAND APPLICATION OF SLUDGE,
Metropolitan Sanitary District of Greater Chicago, Ill. Dept. of Research and Development.
For primary bibliographic entry see Field 5D.
W77-02391

OCEAN DUMPING PHASE-OUT IN EPA REGION II,
S. J. Hadeed.
Journal Water Pollution Control Federation, Vol. 48, No. 10, p 2246-2248, October, 1976.

Descriptors: *Sewage sludge, *Sludge disposal, *Oceans, *Legislation, *Coasts, Legal aspects, Monitoring, Cities, Waste disposal, New York, New Jersey.
Identifiers: Land application, Composting, Pyrolysis.

Environmental Protection Agency plans for phasing out ocean dumping of sewage sludge in Region II are described. Provisions to end ocean dumping by December 31, 1981 will be written into the interim dumping permits which will also prohibit nighttime dumping and recommend an expanded monitoring program. A comprehensive study of land-based alternatives to ocean dumping in Region II contracted by the Environmental Protection Agency indicates that air pollution rules must be waived in the New York and New Jersey metropolitan areas and recommends that regional pyrolysis facilities be constructed in the New York-New Jersey area. Land application or composting is recommended for sludge produced in outlying areas. Senate bill S 3147 which extends the Marine Protection, Research and Sanctuaries Act through fiscal 1977 appropriates $4.8 million for ocean dumping regulation, $5.6 million for ocean dumping research, and $0.5 million for marine sanctuaries. It also requires that the Secretary of the Army, Coast Guard, and Administrator of the Environmental Protection Agency submit annual reports on their respective activities in carrying out the ocean dumping title of the Act. (Kreager-FIRL)
W77-02393

GAS AND LEACHATE FROM LANDFILLS: FORMATION, COLLECTION, AND TREATMENT. PROCEEDINGS OF A RESEARCH SYMPOSIUM.
Municipal Environmental Research Lab., Cincinnati, Ohio.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 161, Price codes: A09 in paper copy, A01 in microfice, Report EPA-600/9-76-004, Edited by E. J. Genetelli and J. Cirello. Held at New Brunswick, N. J., March 25-26, 1975, Published March 1976. 196 p. 104 fig, 47 tab, 102 ref.

Descriptors: *Landfills, *Leachate, *Gases, *Waste disposal, *Solid wastes, Soil types, Migration, Attenuation, Monitoring, Analytical techniques, Research priorities, Toxicity, Hazards, Liners, Recycling, Sludge, Clay minerals, Soil mechanics, Groundwater, Water pollution, Organic compounds.

Topics dealing with the formation, collection, and treatment of gas and leachate from landfills are presented. Specific subjects discussed include: current Environmental Protection Agency activities in solid waste management research; solid waste management research in New York State, Puerto Rico, and the United Kingdom; a theoretical analysis of gas movement through soils; analytical methodologies for leachate and gas analysis; leachate attenuation in undisturbed and remoulded soils; variations in gas and leachate production from baled and non-baled municipal refuse; gas and leachate generation in various solid waste environments; leachate migration through selected clays; the pollution of groundwater by organic compounds generated by landfill activities; attenuation mechanisms of pollutants through soils; the monitoring of toxic chemicals at land disposal sites; an assessment of synthetic and admixed materials for lining landfills; landfill management with leachate recycle and treatment; the effect of shredding and sludge addition on solid waste decomposition; and a case history of landfill gas movement through soils. (See also W77-02395 thru W77-02413) (Kreager-FIRL)
W77-02394

INTRODUCTION TO SYMPOSIUM ON GAS AND LEACHATE FROM LANDFILLS: FORMATION, COLLECTION, AND TREATMENT,
Rutgers - The State Univ., New Brunswick, Dept. of Environmental Science.
A. J. Kaplovsky.
In: Symposium on Gas and Leachate from Landfills: Formation, Collection, and Treatment, March 25-26, 1975, New Brunswick, New Jersey, Department of Environmental Science, Rutgers University, p 1-2.

Descriptors: *Landfills, *Waste disposal, *Leachate, *Soil types, *Soilid wastes, Environmental effects, Environmental sanitation.

Problems associated with assessing the impact of solid waste disposal in landfills are discussed, with particular emphasis on the importance of considering all of the environmental interactions involved. Constituent concentrations of pollutants found during landfill investigations should be carefully qualified by reporting fully the environmental conditions under which the decomposition occurred. For example, simply reporting the constitutent level at a given distance from the source without including the type of soil or medium through which the leachate traveled, the time of transit, or vegetative cover can lead to a misrepresentation of the findings. At the current pace of new legislation and enforcement, it is especially important to appropriately identify findings and to delineate limitations on conclusions. (See also W77-02394) (Kreager-FIRL)
W77-02395

CURRENT EPA RESEARCH ACTIVITIES IN SOLID WASTE MANAGEMENT,
National Environmental Research Center, Cincinnati, Ohio.
N. B. Schomaker, and M. H. Roulier.
In: Symposium on Gas and Leachatfrom Landfills: Formation, Collection, and Treatment, March 25-26, 1975, New Brunswick, New Jersey, Department of Environmental Science, Rutgers University, p 3-11. 1 tab.

Descriptors: *Waste disposal, *Solid wastes, *Reclamation, *Research priorities, *Federal government, Programs, Energy conversion, Land use, Recycling, Regulation.

Environmental Protection Agency research activities dealing with the management and disposal of solid wastes are outlined. The Agency's research efforts in this area include: establishing the basis for a solid waste management regulatory program for hazardous and nonhazardous wastes; determining the human health and environmental effects resulting from the land disposal of selected substances; investigating the migration of hazardous materials through soils and in water transport; establishing the role of soil in controlling or reducing harmful substances reaching water or air; assessing technology for the control of hazardous solid wastes; and evaluating the potential of source reduction, recycling, and energy conversion of solid waste materials. (See also W77-02394) (Kreager-FIRL)
W77-02396

CURRENT OFFICE OF SOLID WASTE MANAGEMENT PROGRAMS - LANDFILL ACTIVITIES,
Environmental Protection Agency, Washington, D.C. Office of Solid Waste Management Programs.
T. V. DeGeare, Jr.
In: Symposium on Gas and Leachate from Landfills: Formation, Collection, and Treatment, March 25-26, 1975, New Brunswick, New Jersey, Department of Environmental Science, Rutgers University, p 12-15.

Descriptors: *Landfills, *Waste disposal, *Research priorities, *Leachate, *Gases, Federal government, Programs, Waste treatment, Solid wastes, Monitoring, On-site investigations, Toxicity, Economics, Groundwater, Soil tests, Soil mechanics, Filtration, Irrigation, Activated sludge.

Research programs currently being conducted by the Environmental Protection Agency's Office of Solid Waste Management which deal with problems related to leachate and gas generation during landfill activities are outlined. These programs include: field monitoring activities to learn about leachate generation and movement under various field conditions; an assessment of the economic impact resulting from the effect of poor waste disposal practices on ground water contamination; studies on the extent to which soil attenuation acts as a mechanism for reducing the harmful effects of leachate; an evaluation of various leachate treatment methods (anaerobic filtration, spray irrigation, activated sludge treatment); and studies on the nature of landfill-generated gas both in terms of its potential as a hazard and as an energy source. (See also W77-02394) (Kreager-FIRL)
W77-02397

CURRENT SOLID WASTE RESEARCH ACTIVITIES IN NEW YORK STATE,
New York State Dept. of Environmental Conservation, N. Y. Div. of Solid Waste Management.
C. N. Goddard.
In: Symposium on Gas and Leachate from Landfills: Formation, Collection, and Treatment, March 25-26, 1975, New Brunswick, New Jersey, Department of Environmental Science, Rutgers University, p 16-17.

Descriptors: *Landfills, *Leachate, *Research priorities, *Waste disposal, *Solid wastes, Monitoring, Streams, Springs, Surface waters, Flow, Analytical techniques, Water pollution, Pollutant identification, *New York, Programs.

Solid waste research being sponsored by the State of New York is described. Leachate from two landfills in the central part of the state is being extensively sampled at a series of surface sample points in springs and streams below the disposal sites to learn more about the conservative nature of various pollutants. Flow measurements are being performed in the streams to provide information on the influence of dilution. This information will then be used to select a set of leachate indices. Another project funded by the Environmental Protection Agency is being conducted concurrently with the above research to investigate various ways of detecting the presence of leachate during the daytime and at night. Various types of films and thermal scanners are being evaluated. (See also W77-02394) (Kreager-FIRL)
W77-02398

CURRENT SOLID WASTE MANAGEMENT ACTIVITIES IN PUERTO RICO,
Puerto Rico Environmental Quality board, San Juan.
S. Robena, Jr.
In: Symposium on Gas and Leachate from Landfills: Formation, Collection, and Treatment, March 25-26, 1975, New Brunswick, New Jersey,

Department of Environmental Science, Rutgers University, p 18-25. 1 fig, 2 tab, 8 ref.

Descriptors: *Solid wastes, *Waste disposal, *Landfills, *Leachate, *Research priorities, *Energy conversion, Monitoring, Pollutant identification, Reclamation, Economics, Feasibility studies, Physical properties, Chemical properties, Surveys, Information exchange, Groundwater, Toxicity, *Puerto Rico.

Research activities on solid waste management in Puerto Rico are reviewed. Studies on leachate formation at different sanitary landfill sites have been initiated in coordination with the United States Geological Survey. A long-range plan for a continuous monitoring program at solid waste disposal sites has been proposed to assess the quality of groundwater near landfill sites. Advanced resource recovery studies are being conducted to investigate the feasibility of using metropolitan solid waste as an auxiliary fuel and to evaluate existing markets for segregated solid wastes, paper, glass, and metals. Community information programs are also being conducted. An island-wide survey of industrial hazardous and toxic wastes is being performed so that a state plan for the management of these wastes can be formulated. Detailed physical and chemical data from an analysis of leachate sampled at one of the landfill sites investigated are tabulated. (See also W77-02394) (Kreager-FIRL)
W77-02399

LANDFILL RESEARCH WORK IN PROGRESS AT HARWELLS HAZARDOUS MATERIALS SERVICE,
Atomic Energy Research Establishment, Harwell (England).
J. Bromley.
In: Symposium on Gas and Leachate from Landfills: Formation, Collection, and Treatment, March 25-26, 1975, New Brunswick, New Jersey, Department of Environmental Science, Rutgers University, p 27-32.

Descriptors: *Solid wastes, *Waste disposal, *Leachate, *Landfills, *Research priorities, Reclamation, On-site investigations, Leaching, Movement, Rock properties, Chemical wastes, Toxicity.
Identifiers: *United Kingdom.

Research on solid waste management in the United Kingdom is reviewed, with particular emphasis on landfill site studies. The research activities include: the reclamation of landfill sites; the development of a data bank on potentially hazardous materials deposited into landfills; on-site investigations of different types of landfills; supporting lysimeter programs; studies on the behavior of selected toxic wastes associated with landfill leachate; studies of the movement of toxic leachate through sandstone, chalk, and gravel; experiments involving the exposure of different rock cores to synthetic leachate mixtures; studies on the relative rates at which various toxic materials are leached from actual wastes; and evaluations of encapsulation procedures for preventing the release of toxic wastes to landfills under different conditions. (See also W77-02394) (Kreager-FIRL)
W77-02400

THEORETICAL APPROACH TO GAS MOVEMENT THROUGH SOILS,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-02401

ANALYTICAL METHODOLOGIES FOR LEACHATE AND GAS ANALYSIS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W77-02402

LEACHATE ATTENUATION IN UNDISTURBED AND REMOULDED SOILS,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-02403

VARIATIONS IN GAS AND LEACHATE PRODUCTION FROM BALED AND NON-BALED MUNICIPAL REFUSE,
Systems Technology Corp., Dayton, Ohio.
M. C. Eifert.
In: Symposium on Gas and Leachate from Landfills: Formation, Collection, and Treatment, March 25-26, 1975, New Brunswick, New Jersey, Department of Environmental Science, Rutgers University, p 71-82. 10 fig, 3 tab.

Descriptors: *Leachate, *Gases, *Landfills, *Municipal wastes, *Waste disposal, Color, Conductivity, Chemical oxygen demand, Hardness(Water), Carbon, Iron, Copper, Zinc, Nickel, Chemical analysis, Solid wastes, *Pollutant identification.

Experiments involving the use of five landfill simulators filled with municipal refuse were performed to investigate gas and leachate production. Although insufficient gas was generated for analysis, leachate was collected several times. The first leachate collected appeared to be the squeezings from the solid waste during loading. Further leachates gathered reflected leachate generated from moisture additions. The experiments are still underway, and no conclusions can be drawn because of the limited amount of data thus far generated. Leachate analytical data for color, pH, conductivity, chemical oxygen demand, hardness, total organic carbon, volume, iron, copper, zinc, and nickel are tabulated. (See also W77-02394) (Kreager-FIRL)
W77-02404

GAS AND LEACHATE GENERATION IN VARIOUS SOLID WASTE ENVIRONMENTS,
Systems Technology Corp., Dayton, Ohio.
A. G. Jackson, and D. R. Streng.
In: Symposium on Gas and Leachate from Landfills: Formation, Collection, and Treatment, March 25-26, 1975, New Brunswick, New Jersey, Department of Environmental Science, Rutgers University, p 83-091. 2 fig, 5 tab.

Descriptors: *Landfills, *Leachate, *Gases, *Chemical analysis, *Microbiology, Waste disposal, Coliforms, Streptococcus, Methane, Chemical properties, Solid wastes, Simulation analysis, *Pollutant identification.

Ongoing experiments to investigate gas and leachate generation in different solid waste environments are reported. Landfill simulations with test cells containing solid waste and selected other wastes have been in progress for about 4 months. The cells are in the early stages of methane generation and have just completed the change from aerobic to anaerobic condition. Microbiological assay of the leachate revealed high levels (generally 100,000 colonies/100 milliliters) of fecal coliforms and fecal streptococcus in the initial leachate collected. Analysis of the leachates that followed revealed an increasing dieoff of coliforms in the leachate as the cell aged. Streptococcus remained quite high for several months but is now beginning to decrease. Detailed chemical data for the leachate and gas collected thus far are tabulated. (See also W77-02394) (Kreager-FIRL)
W77-02405

LEACHATE MIGRATION THROUGH SELECTED CLAYS,
Illinois State Geological Society, Urbana.
For primary bibliographic entry see Field 5B.
W77-02406

ORGANIC POLLUTANTS CONTRIBUTED TO GROUNDWATER BY A LANDFILL,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 5B.
W77-02407

ATTENUATION MECHANISMS OF POLLUTANTS THROUGH SOILS,
Arizona Univ., Tucson. Coll. of Agriculture.
For primary bibliographic entry see Field 5B.
W77-02408

MONITORING TOXIC CHEMICALS IN LAND DISPOSAL SITES,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5A.
W77-02409

ASSESSING SYNTHETIC AND ADMIXED MATERIALS FOR LINING LANDFILLS,
Matrecon, Inc., Oakland, Calif.
H. E. Haxo, Jr.
In: Symposium on Gas and Leachate from Landfills: Formation, Collection, and Treatment, March 25-26, 1975, New Brunswick, New Jersey, Department of Environmental Science, Rutgers University, p 130-158. 8 fig, 14 tab, 26 ref.

Descriptors: *Linings, *Landfills, *Leachate, *Waste disposal, *Simulation analysis, Materials, Polymers, Asphalt, Soils, Physical properties, Performance, Evaluation.

Experiments involving the use of various polymeric and admixed materials for landfill liners are reported. The liners are mounted as barriers in the bases of 24 simulated sanitary landfills which are uniformly filled with a shredded municipal refuse with a moisture content of 30%. In addition, 42 small membrane specimens are being exposed to leachate by being placed in the sand above the barriers. To date, only a soil-asphalt liner appears to be inadequate. Leachate is seeping through one specimen of this type, and indications are that a second liner of this type will also leak. Sealing the liners into the generator bases with a cast epoxy ring has worked out satisfactorily except for the soil-asphalt liner. Polyethylene film appears to be sensitive to creasing and puncturing, although it has not failed as a barrier. Laboratory tests of unexposed membrane liners of the same polymer indicate that there can be considerable liner-to-liner variation in liners of the same polymer type. These variations probably reflect differences in compounding and in fabrication of the liner materials. (See also W77-02394) (Kreager-FIRL)
W77-02410

LANDFILL MANAGEMENT WITH LEACHATE RECYCLE AND TREATMENT: AN OVERVIEW,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-02411

SOLID WASTE DEGRADATION DUE TO SHREDDING AND SLUDGE ADDITION,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
R. K. Ham.
In: Symposium on Gas and Leachate from Landfills: Formation, Collection, and Treatment, March 25-26, 1975, New Brunswick, New Jersey, Department of Environmental Science, Rutgers University, p 168-176. 6 fig, 1 tab, 5 ref.

Descriptors: *Landfills, *Solid wastes, *Sludge, *Waste disposal, *Waste treatment, Leachate, Methane, Biological treatment, Chemical reactions, Evaluation, Performance, Odor.

Experiments investigating the effects of shredding and sludge addition on refuse decomposition in landfills are reported. The shredding of refuse promoted decomposition, resulting in rapid oxygen use and methane production as well as stabilization of leachate contaminant production. Cover prolonged the period of acidic leachate production and postponed methane production. The addition of sludge to shredded refuse resulted in odors, and a 70% water mixture was not workable. Flies were attracted to the refuse-sludge cells, whereas no flies were observed in cells without sludge. Rodent activity developed on noncompacted cells but was not observed on the compacted cells. The production of leachate per ton of dry refuse increased markedly with initial percent water and was not a strong function of compaction or depth. It appears that environmental and operational problems associated with the incorporation of sludge with refuse may negate any advantages of the process. (See also W77-02394) (Kreager-FIRL)
W77-02412

CASE HISTORY OF LANDFILL GAS MOVEMENT THROUGH SOILS,
Cook Coll., New Brnswick, N. J.
F. B. Flower.
In: Symposium on Gas and Leachate from Landfills: Formation, Collection, and Treatment, March 25-26, 1975, New Brunswick, New Jersey, Department of Environmental Science, Rutgers University, p 177-189. 14 fig.

Descriptors: *Landfills, *Waste disposal, *Gases, Migration, *Phytotoxicity, Vegetation, Hazards, Solid wastes, On-site investigations, *Path of pollutants.

Three cases of landfill gas migration problems are reviewed. Each case involved the disposal of commercial refuse in old sand and gravel pits. Problems resulting from the migration of gas generated from the landfills included the death of peach trees, the death of ornamental vegetation, and the demise of commercial farm crops. One case also involved the entrance of combustible gases into private residences adjacent the landfill. The studies demonstrated that injury and death of vegetation can be used as indicators of the presence of landfill gases in the surface soil layers; however, the gases can travel laterally below vegetation without injuring it and appear at the surface at a greater distance from the landfill. The studies also demonstrated that sand and gravel pits are not good places for refuse disposal if lateral gas migration is to be prevented. If old sand and gravel pits are used as refuse, landfills, gas vents and seals should be placed at the outer edge of the landfill prior to refuse deposition. (See also W77-02394) (Kreager-FIRL)
W77-02413

AN EXPERIMENTAL HIGH-ASH PAPER MILL SLUDGE LANDFILL: SECOND ANNUAL REPORT,
Michigan State Univ., East Lansing. Div. of Engineering Research.
O. B. Andersland, W. A. Charlie, R. P. Vallee, and D. W. Marshall.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-239 618, Price codes: A11 in paper copy, A01 in microfiche. Report EPA-670/2-74-076b, December, 1974, 246 p, 58 fig, 39 ref, 83 tab.

Descriptors: *Sludge disposal, *Landfills, *Pulp wastes, Ultimate disposal, Wastes, Industrial wastes, Water pollution sources, Solid wastes, Sludge, Organic wastes, Consolidation, Soil mechanics, Soil stabilization, Waste disposal, Land forming, Leachate, Leaching, Slope stability, Slopes, Sulfates, Nitrogen, Phosphorus, Iron, Chlorides, Hardness(Water), Salts.

For the slope stability study, the experimental paper mill sludge landfill was altered by removal of one retaining dike. The landfill was excavated to form a 3:4 slope and two weeks later was trimmed to a 1:8 slope. Prior to this modification, vane shear strength and Dutch cone resistance data were obtained. Slope indicator and piezometers were installed. Laboratory work included consolidation tests on undisturbed sludge samples. It is shown that soil mechanics theory can be used to predict the stability of slopes excavated in a sludge landfill. The increase in shear strength of the sludge as a direct consequence of consolidatiion resulted in a stable 3:4 slope with small observed lateral movements. Lateral movements increased rapidly after excavation to the 1:8 slope. The low permeability of the sludge together with a decreasing rate of leachate flow associated with fill consolidation exerted a moderating effect on the quantity of leachate leaving the landfill. Leachate analyses showed that the quantities of sulfate, Kjeldahl nitrogen, phosphorus, iron, and chloride were below values cited for municipal refuse. Concentrations of mineral salts and hardness were similar to those for leachate originating in landfills of municipal refuse. (Witt-IPC)
W77-02555

AN EXPERIMENTAL HIGH-ASH PAPER MILL SLUDGE LANDFILL: FIRST ANNUAL REPORT,
Michigan State Univ., East Lansing. Div. of Engineering Research.
O. B. Andersland, R. P. Vallee, and T. A. Armstrong.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-239 869, Price codes: A09 in paper copy, A01 in microfiche. Report EPA-670/2-74-076a, December, 1974. 190 p, 67 fig, 36 ref, 43 tab.

Descriptors: *Sludge disposal, *Landfills, *Pulp wastes, Ultimate disposal, Wastes, Industrial wastes, Water pollution sources, Solid wastes, Sludge, Organic wastes, Consolidation, Soil mechanics, Soil stabilization, Waste disposal, Land forming, Leachate, Mechanical engineering, Lysimeters, Leaching.

An experimental landfill for paper mill sludge rich in ash (mineral elements) was constructed and monitored to obtain engineering data essential for development of guidelines and recommendations for the design and operation of future landfills for solid paper mill wastes. The landfill consisted of two sludge layers, with sand drainage blankets, an earth dike for lateral confinement, and a natural soil cover. The landfill was instrumented for settlement, water pressure, vertical and lateral earth pressure, temperature, sludge unit weights, specific gravity, and water content. Laboratory work was also conducted. A detailed description of the field behavior of the sludge is given along with predictions based on laboratory results and soil mechanics theory. Sampling of leachate from the sludge landfill at weekly intervals and laboratory analysis according to standard methods for the examination of water and waste water provided documentation as to leachate composition. A lysimeter study showed that passage of leachate through a minimal depth of soil should render the percolate innocuous. (Witt-IPC)
W77-02556

C(ROWN) Z(ELLERBACH)'S SOLIDS WASTE PROBLEMS AT WAUNA ARE REDUCED BY COMPOSTING,
Crown Zellerbach Corp., Wauna, Oreg.
M. L. Wysong.
Pulp and Paper, Vol. 60, No. 10, p 112-113, September, 1976.

Descriptors: *Sludge disposal, *Pulp and paper industry, *Biodegradation, Soil amendments, Temperature, Hydrogen ion concentration, Cellulose, Aeration, Operating costs, Costs, Pulp wastes, Oregon, Solid wastes, Waste disposal, Sewage treatment, Forest management.
Identifiers: *Composting.

Composting of a mixture of primary paper mill sludge and secondary sludge obtained from a municipal sewage-treatment facility at Wauna, Oregon, was investigated by Crown Zellerbach Corp. in order to determine the feasibility of forest amendment broadcasting as an alternative to landfilling for disposal of sludge. The composting operation was evaluated by measurement of volume reduction, total weight reduction, temperature, aeration, pH, and cellulose content. Composting provided volume and weight reductions in excess of 50%. A full-scale compost operation could be run for less than $100,000/year at this mill which generates an average of 70 dry tons/day. (Sykes-IPC)
W77-02572

STUDY OF DEWATERING OF CELLULOSIC SLUDGE FROM THE VISCOSE FIBER INDUSTRY (ISSLEDOVANIE PO OBEZVOZHIVANIYU TSELLYULOZNOGO SHLAMA PREDPRIYATII VISKOZNOGO VOLOKNA),
Lvovskii Politekhnicheskii Institut (USSR).
For primary bibliographic entry see Field 5D.
W77-02575

5F. Water Treatment and Quality Alteration

WATER SUPPLY AND SEWAGE TREATMENT IN ARID AREAS.
For primary bibliographic entry see Field 5D.
W77-02173

DESALINATION TO PLAY A MAJOR PART IN MIDDLE EAST WATER SUPPLY.
For primary bibliographic entry see Field 3A.
W77-02175

REMOVAL OF VIRUSES FROM WATER BY MAGNETIC FILTRATION,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W77-02214

POLYELECTROLYTE PERSISTENCE IN A MUNICIPAL WATER SUPPLY,
Minnesota Univ., Minneapolis. Div. of Environmental Health.
V. Goppers, and C. P. Straub.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 502, Price codes: A02 in paper copy, A01 in microfiche. (Sept. 15, 1975). 8 p, 1 fig, 5 ref. OWRT A-029-MINN(1).

Descriptors: *Polyelectrolytes, *Municipal water, *Water supply, Polymers, Chromatography, *Water treatment, Public health, *Pollutant identification, Organic compounds.

Polyelectrolytes or polymers are compounds of high molecular weight whose structure is made up of many smaller molecules -- monomers. These compounds contain a number of functional groups with reactive double bonds. In recent years, these synthetic polymers have found increasing use in water supply as coagulant and filter aids, and in the dewatering of sludges. The thin-layer chromatograms demonstrated that: (1) the polyelectrolyte is present in finished water, (2) the polyelectrolyte in finished water appears as the polymer and as monomers, (3) the polyelectrolyte or other added chemicals (e.g., chlorine) reacted with the organic compounds in raw water forming new substances which were transferred through the various stages of water treatment to the

finished water prior to discharge to the distribution system for human consumption. The finding of the polyelectrolyte or its monomers in the finished water in itself does not necessarily constitute a health hazard. However, the presence of this material in the finished water should encourage attempts to quantify the amounts present and their distribution within the various products of water treatment, i.e., finished water, sludge, backwash waters, etc., and their effects on the recycling and recovery of water treatment sludges. With such information available, it will be possible to evaluate the potential hazard of these substances on the public health of persons consuming these waters. (Walti-Minnesota)
W77-02221

THE BARRIER ROLE OF WATER TREATMENT INSTALLATIONS WITH RESPECT TO CERTAIN HETEROCYCLIC COMPOUNDS, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
A. A. Korolev, and V. P. Laskina.
Gig Sanit 8, p 15-17, 1975.

Descriptors: *Water treatment, Organic compounds, Barriers, Potable water, Treatment facilities.
Identifiers: *Morpholine, *Piperidine, *Pyridines, *Heterocyclic compounds.

Heterocyclic compounds such as morpholine and piperidine are highly resistant to physico-chemical drinking water treatment. The barrier role of the water-works installations apparently is limited in respect to other heterocyclic compounds, particularly the pyridines, due to the close relation of their physico-chemical properties to those of the investigated substances.--Copyright 1976, Biological Abstracts, Inc.
W77-02240

HYGIENIC ASPECTS OF A STUDY OF BDELLOVIBRIO BACTERIOVORUS AS A NATURAL FACTOR OF SELF-PURIFICATION OF WATER BODIES, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR).
For primary bibliographic entry see Field 5C.
W77-02243

EVALUATION OF METHODS OF RECOVERING PATHOGENIC INTESTINAL MICROORGANISMS FROM WATER, (IN RUSSIAN),
Gorodskaya Sanitarno-Epidemiologicheskaya Stantsiya, Moscow (USSR).
K. M. Klimenkova.
Gig Sanit 8, p 86, 1975.

Descriptors: *Microorganisms, *Enteric bacteria, E coli, Pathogenic bacteria, Filters, Membranes, Water pollution, Magnesium, *Water treatment.
Identifiers: Lactose negatives, Selenite.

For recovering enteropathogenic bacteria (lactose negative and Escherichia coli), the bacteria were concentrated on membrane filters and cultivated on Endo medium; then the filters were placed in selenite and Mg enrichment media.--Copyright 1976, Biological Abstracts, Inc.
W77-02244

EFFECTIVENESS OF CONTINUOUS CHLORINATION OF WELL WATER BY DOSAGE CARTRIDGES IN TRANSCARPATHIA, (IN RUSSIAN),
R. I. Grishchenko.
Gig Sanit 10, p 92-93, 1975.

Descriptors: *Chlorination, *Water wells, Chlorine, Human diseases, Epidemiology, Water supply, *Disinfection, *Water treatment.
Identifiers: *Transcarpathia(USSR), Typhoid fever, USSR.

Continuous chlorination of wells by dosage cartridges maintains the level of residual Cl in the water within 0.3-0.5 mg/l and provides sufficiently effective decontamination for 28-30 days. Standard cartridges have an explicit advantage over nonstandard, since they enable calculation of the necessary quantity of Cl-active preparation and provide a uniform release of active Cl into the water. The wide use of the method of continuous chlorination of well water in localities (USSR) with a relatively high incidence of typhoid fever related epidemiologically with a well water supply can reduce the incidence considerably.--Copyright 1976, Biological Abstracts, Inc.
W77-02256

FLOW DATA COLLECTION FOR INFILTRATION-INFLOW ANALYSIS,
Whitman, Requardt and Associates, Baltimore, Md.
For primary bibliographic entry see Field 5D.
W77-02334

NEED FOR FLUORIDATION OF DRINKING WATER IN KRASNODON, (IN RUSSIAN),
Municipal Sanitary Epidemiology Station, Krasnodon (USSR).
O. V. Chernykh.
Gig Sanit 3, p 108-109, 1975.

Descriptors: *Fluoridation, *Potable water, Water supply, Public health, *Water treatment.
Identifiers: Caries(Children), *Krasnodon, Ukrainian-SSR, USSR.

Fluoride content in the drinking water of Krasnodon, Ukrainian SSR, USSR, was analyzed, and its effect on caries incidence of schoolchildren was studied. A high percentage of caries was found in 2031 examined children; the city's drinking water should be fluoridated.
W77-02338

WATER HARDNESS AND INCIDENCE OF MALIGNANT NEOPLASMS AMONG THE POPULATION, (IN RUSSIAN),
Minsk, USSR Research Inst. of Oncology and Medical Radiology, Minsk (USSR).
L. L. Livshits, A. G. Kokina, A. E. Okeanov, E. A. Gel'Fer, and A. A. Kuznetsova.
Gig Sanit 1, p 106-108, 1975.

Descriptors: *Hardness(Water), Human population, *Human diseases, Potable water, *Public health, Statistical methods.
Identifiers: *Belorussian-SSR, Bladder, Kidneys, *Neoplasms(Malignant), USSR.

Average water hardness in the Minsk hardwater district and Brest soft-water district (Belorussian SSR, USSR) are inversely related to the incidence of malignant neoplasms of the kidneys and urinary bladder among the rural population. In the presence of other environmental factors this relationship is not sufficiently strong to indicate low drinking water hardness as a causative factor in increased malignant neoplasm incidence.--Copyright 1976, Biological Abstracts, Inc.
W77-02384

REMOVAL BENEFITS: IT CAN BE TOO COSTLY,
Kansas City Water Dept., Mo.
For primary bibliographic entry see Field 5D.
W77-02436

CARPET AND RUG INDUSTRY CASE STUDY I: WATER AND WASTEWATER TREATMENT PLANT OPERATION,
Georgia State Univ., Atlanta.
For primary bibliographic entry see Field 5D.
W77-02574

5G. Water Quality Control

ANALYSIS OF STORM WATER SEEPAGE BASINS IN PENINSULAR FLORIDA,
Florida Univ., Gainesville. Dept. of Civil Engineering.
H. Rubin, J. P. Glass, and A. A. Hunt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 393, Price codes: A07 in paper copy, A01 in microfiche. Florida Water Resources Research Center, Gainesville, Publication No. 39, September 1976. 121 p, 15 fig, 62 ref, 3 append. OWRT A-028-FLA(2). 14-34-0001-6010.

Descriptors: Pit recharge, Ponding, *Artificial recharge, Groundwater recharge, Infiltration, *Seepage, Water spreading, Aquifers, *Florida, *Drainage systems, Urbanization, *Storm water, *Flood control, Pollution abatement, Design criteria.

Rapid urbanization, currently proceeding in Florida, has resulted in significant problems with regard to both flood control and pollution abatement. The objective of the study was to search for the design procedures that may improve efficiency, safety and adequacy of drainage systems in peninsular Florida. Special attention was given to possiblities of recharging groundwater aquifers with excess storm water. Through such a system, partial solution to problems of inadequate potable water supply in some areas can be achieved simply as a byproduct of flood control systems. A conceptual design framework is presented. In developing this framework, a variety of disciplines involved in the solution of urban drainage systems in peninsular Florida are considered. Comparatively high levels of groundwater in many locations require consideration of two factors relating to the ability of seepage ponds to divert surface water to the aquifer. The engineer should study the ability of the pond to seep water and he should analyze the response of the groundwater table to the seeping water. With respect to these two factors, analyses and solutions adapted for engineering application are presented.
W77-02083

EVALUATION OF ESTUARINE SITE DEVELOPMENT LAGOONS,
Cook Coll., New Brunswick, N.J.
G. F. Walton, G. H. Nieswand, S. J. Toth, C. W. Stillman, and J. R. Westman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 367, Price codes: A09 in paper copy, A01 in microfiche. Water Resources Research Institute, New Brunswick, New Jersey, Final Report, July 1, 1976. 167 p, 20 fig, 25 tab, 20 ref, append. OWRT B-040-NJ(5). 14-31-0001-3614.

Descriptors: *Estuarine environment, *Impaired water quality, *Lagoons, *Aquatic environment, *Environmental effects, *Wetlands, Bays, Coasts, Encroachment, Water quality, Water pollution, Salt marshes, Shores, Tidal waters, *New Jersey.
Identifiers: *Site development lagoons.

A large number of estuarine site development lagoon systems have been constructed along the New Jersey shore with little, if any, knowledge regarding the true nature of the system being created and its impact on the existing natural estuarine system. A comprehensive study and evaluation of these lagoon systems was undertaken including consideration of the physical, chemical, biological and socioeconomic conditions. While each chapter of the report includes a section on specific conclusions, certain general conclusions can be made. Namely, using Barnegat Bay as a standard, the lagoon waters were of poorer quality, due in large measure to the restricted and weakly-established water circulation patterns in the lagoons. In terms of the socioeconomic conditions, the residents are generally quite satisfied with their lagoon homes in

spite of their perception of major pollution and over-development problems. In fact, many owners are converting their homes to year-round residences.
W77-02088

A SUBMODEL FOR NITROGEN RELEASE FROM SEDIMENTS,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
For primary bibliographic entry see Field 5B.
W77-02099

MANAGING THE SOUTHWESTERN NATIONAL FORESTS FOR WATER AND RELATED RESOURCES,
Forest Service (USDA), Washington, D. C.
For primary bibliographic entry see Field 4A.
W77-02107

WATER USE IMPLICATIONS FOR NUCLEAR POWER STATIONS IN THE UNITED STATES OF AMERICA,
Columbia Univ., New York.
For primary bibliographic entry see Field 6G.
W77-02114

ON THE INCOME DISTRIBUTIONAL EFFECTS OF ENVIRONMENTAL MANAGEMENT POLICIES,
British Columbia Univ., Vancouver. Dept. of Economics.
H. F. Campbell.
Water Resources Research, Vol. 12, No. 5, p 1077-1080, October 1976. 3 tab, 6 ref, append.

Descriptors: *Water resources, *Income distribution, *Effects, *Environmental control, *Effluents, *Standards, *Treatment, Technology, Behavior, Simulation analysis, Prices, Mathematical models, Systems analysis, Optimum development plans.
Identifiers: *Environmental policy, *Environmental management, Effluent charges.

This paper analyzes the effects of three environmental policy instruments--effluent charges, effluent standards, and effluent treatment subsidies--in the context of a two-person two-firm general equilibrium model in which the distribution of income varies with the choice of policy instrument. It is demonstrated that, under reasonable assumptions about the income distribution process and the nature of consumer preferences, each policy instrument corresponds to a different optimal quantity of effluent and a different set of optimal prices. The implication of this result is that consideration of income distriubtional effects should play an integral part in the formulation of optimal environmental management policies. (Bell-Cornell)
W77-02124

CONTROLLING EROSION AND SEDIMENTATION AT CONSTRUCTION SITES,
For primary bibliographic entry see Field 4D.
W77-02146

HYGIENIC STANDARDIZATION OF DIETHYLBENZENE IN WATER BODIES, (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
K. F. Meleshchenko.
Gig Sanit 6, p 90-92, 1975.

Descriptors: *Ion exchange, Resins, Public health, *Water quality standards, *Organic compounds, Toxicity, Odor, Lethal limit, Organoleptic properties.
Identifiers: *Benzene, Rabbit, Styrene, Dichloroethane, *Divinylbenzene, *Ion exchange resins.

The production of ion-exchange resins is related to the use of divinylbenzene, the starting materials for which are diethylbenzene, styrene, dichloroethane, etc. The threshold concentration of diethylbenzene in water with respect to odor and taste was 0.04 - 0.05 mg/l. Diethylbenzene doses of 0.0025 and 0.25 mg/kg do not affect warm-blooded animals (rabbits), whereas a dose of 2.5 mg/kg does. In the latter case there is a statistically significant decrease of the weight of the adrenal glands and summation of subthreshold impulses. The recommended maximum allowable concentration of diethylbenzene in water bodies is 0.04 - 0.05 ml/l, with the limiting index of the hazard of this preparation being its effect on the organoleptic properties of water.
W77-02152

FOURTH SEMIANNUAL INTERAGENCY BRIEFING, FEBRUARY 1975, WASHINGTON, D.C.,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 8G.
W77-02158

THE COPPER INDUSTRY AND WATER IN ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 3E.
W77-02166

SWIMMING PARTICIPATION AND WATER QUALITY IN TOMPKINS COUNTY, NEW YORK,
Cornell Univ., Ithaca, N. Y. Dept. of Natural Resources.
T. L. Brown, and G. R. Reetz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 357, Price codes: A04 in paper copy, A01 in microfiche. Cornell University Water Resources and Marine Sciences Center, Completion Report, November 1976. 53 p, 1 fig, 17 tab. OWRT B-039-NY(1). 14-31-0001-4110.

Descriptors: *Swimming, Water quality, *Water quality standards, *Recreation, *New York, Social participation, *Attitudes, Evaluation, Social values.
Identifiers: *Tompkins County(NY).

Following an intensive literature search, a systematic sample of Tompkins County households were surveyed to determine frequency of swimming participation, the degree to which residents swim in waters not approved for swimming, degree of public understanding and agreement with existing swimming standards, and the degree to which swimming participation is affected by perceptions of water quality. Findings indicated that most of Tompkins County's outdoor swimming occurs in natural area streams that are not regularly monitored by the local health department for water quality. Further, the majority of responding adults could not give an evaluation on the degree of strictness of existing standards for swimming. Attitudes toward water quality appear to have some influence on swimming participation and the choice of a swimming area, but in Tompkins County, other considerations such as convenience were more important.
W77-02185

CHANGES IN BENTHOS AND FISHES OF A STREAM ACCOMPANYING A SUBSTANTIAL REDUCTION IN PLANT NUTRIENTS,
Pennsylvania State Univ., University Park. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-02191

HERBICIDES AND SURFACE IRRIGATION-DO THEY MAKE A TEAM,
For primary bibliographic entry see Field 3F.
W77-02200

WATER POLLUTION INVESTIGATION: DULUTH-SUPERIOR AREA,
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5B.
W77-02202

COMPILATION OF STATE DATA FOR EIGHT SELECTED TOXIC SUBSTANCES, VOL. 1, FINAL REPORT,
Mitre Corp., McLean, Va.
E. R. Roberts, S. Spewack, S. Stryker, and S. Tracey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 660, Price codes: A08 in paper copy, A01 in microfiche. Environmental Protection Agency, Washington, D.C. Report EPA 560/7-75-001-01, September 1975. 162 p, 2 tab, 3 fig.

Descriptors: *Data collections, *Beryllium, *Cadmium, *Chromium, *Lead, *Mercury, *Polychlorinated biphenyls, *Arsenic compounds, *Monitoring, Public health, Metals, Heavy metals, Trace elements, Lethal limit.
Identifiers: *Arsenic, *Cyanide, Arylphosphate, Benzene, 3,3'-dichloro-benzidine, *Ethylene glycol, Hydrazine methyl chloroform, *A-napthylamine, Acrylonitrite, Monitoring capability, *State Monitoring agencies.

In June 1974, the Office of Toxic Substances, EPA, contracted with MITRE to collect and analyze toxic substances data in the U.S. In the next 14 months, MITRE contacted agencies in 20 key states and collected and analyzed their monitoring data. This report describes that effort and discusses the amount, type and usefulness of the data and the toxic substances monitoring capabilities of the state agencies contacted. Substances studied were Arsenic, beryllium, cadmium, chromium, cyanide, lead, mercury, polychlorinated biphenyls, and other toxic substances. The monitoring capabilities of various states were described and the particular toxicity problems as viewed by the states are given. (See also W77-02205) (Katz)
W77-02204

COMPILATION OF STATE DATA FOR EIGHT SELECTED TOXIC SUBSTANCES, VOL. IV, COMPILATIONS OF SUMMARIES AND ANALYSES OF STATE DATA,
Mitre Corporation, McLean, Va.
E. Roberts, R. Spewak, S. Stryker, and S. Tracey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 663, Price codes: A99 in paper copy, A01 in microfiche. Environmental Protection Agency, Washington, D.C., Report EPA 560/7-75-001-4, September 1975, 644 p., 125 tab., 24 fig., append.

Descriptors: *Arsenic compounds, *Beryllium, *Cadmium, *Chromium, *Lead, *Mercury, *Polychlorinated biphenyls, *Data collections, Data storage and retrieval, *Zinc, *Mussels, *Fish, *Biota, *Wildlife, Public Health, Sewage, United States.
Identifiers: *Cyanide, *Arsenic, *Toxic substances.

In June 1974, the Office of Toxic Substances, EPA, contracted with MITRE to collect and analyze toxic substances data in the U.S. In the next 14 months MITRE contacted agencies in 20 key states and collected and analyzed their monitoring data. This appendix contains all the summaries and analyses of state agency data that were presented in the four quarterly reports during the course of the project. Substances discussed were: arsenic, beryllium, cadmium, chromium, cyanide,

lead, mercury, polychlorinatd biphenyls, zinc. (Katz)
W77-02205

SYSTEM FOR EVALUATION OF THE HAZARDS OF BULK WATER TRANSPORTATION OF INDUSTRIAL CHEMICALS,
National Academy of Sciences, Washington, D.C. Committee on Hazardous Materials.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-782 476, Price codes: A04 in paper copy, A01 in microfiche. Coast Guard Report CG-D-113-74, February 1974. 42 pp., 14 tab., 12 ref.

Descriptors: *Transportation, Ships, *Safety, Barges, Distribution, Harbors, Water pollution, Public health, Environmental Sanitation, Water quality, *Hazards, Negligence, *Safety, *Warning systems, Industries, Marketing.
Identifiers: *Bulk water transportation, Industrial chemicals, Fire hazard, Reactivity hazards.

The U. S. Coast Guard has requested the assistance of the Committee on Hazardous Materials of the National Research Council in developing a system of evaluating the potential hazard associated with the water transportation of industrial chemicals in bulk. Numerous schemes for assessing the hazards of materials have been developed by various organizations, but none completely fulfils the Coast Guard requirements, since most of the existing schemes have been developed for purposes other than assessment of hazard in bulk water transportation. It was also suggested by the Coast Guard that the system of hazard evaluation should deal with the several kinds of hazards presented in varying degrees by individual chemicals. This is a report of results, to date, of the efforts of the Committee on Hazardous Materials to develop and evolve a scheme of hazard evaluation. (Katz)
W77-02206

ACID MINE DRAINAGE (A BIBLIOGRAPHY WITH ABSTRACTS),
National Technical Information Service, Springfield, Va.
January 1975, 137 p., 137 ref.

Descriptors: *Mine acids, *Mine drainage, *Mine wastes, *Mine water, *Bibliographies, *Abstracts, Mining, Environmental effects, Environmental control, Waste treatment, Ecology, Mining engineering, Engineering geology, Waste disposal.

Various aspects of mine acid drainage are covered in 137 abstracts. Primarily they cover control and treatment techniques; however, also included are studies on the ecological effects, sources, and formation. (Katz)
W77-02207

WATER QUALITY IMPACTS OF URANIUM MINING AND MILLING ACTIVITIES IN THE GRANTS MINERAL BELT, NEW MEXICO,
Environmental Protection Agency. Dallas, Tex. Region VI.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 470, Price codes: A09 in paper copy, A01 in microfiche. Report EPA 906/9-75-002, September 1975, 182 p., 15 tab., 12 fig., 34 ref.

Descriptors: *Water quality, *Mining, Waste disposal, Water pollution, *Groundwater, Potable water, Surface water, *Uranium, *Radioisotopes, *Mine water, Mills, Waste disposal, Municipal water, *New Mexico, Public Health, Environment, Water supply.
Identifiers: *Selenium, *Uranium mining, *Uranium milling, *Grants mineral belt(N Mex).

Ground water in the study area is affected by mining and waste disposal associated with mining and milling. Contamination appears in close proximity to the mining and milling centers with the exception of more widespread selenium contamination of shallow ground water adjacent to the United Nuclear-Homestake Partners Mill. Contamination of municipally operated water supplies in the study area is not evident. Potable supplies derived from mine water at four industrial sites exceed applicable limits for selenium in drining water. Three such systems exceed limits for Radium 226. Recommendations developed are designed to assist the State in future regulation of uranium mining and milling for the purpose of safeguarding public health and insuring future environmental quality. (Katz)
W77-02208

EAGLE LAKE POLLUTION CONTROL PROJECT, EAGLE LAKE KANDIYOHI COUNTY, MINNESOTA, BENCH MARK STUDIES,
Minnesota Univ., Minneapolis. Water Resources Research Center.
T. E. Straw, R. S. Abbott, R. J. Grohs, R. F. Holt, and J. J. Latterell.
Bulletin 90, August 1976. 152 p. 34 fig, 36 tab, 54 ref. OWRT A-999-MINN(43), 14-34-0001-7050.

Descriptors: Community development, Soil disposal fields, Water pollution control, Lakes, *Minnesota, *Agricultural runoff, *Sewage, *Nutrient removal, Diversion, *Eutrophication, Recreation, *Attitudes.
Identifiers: *Eagle Lake(Minn).

Cooperative efforts are described of a lake community and several governmental agencies that were undertaken to alleviate increasing cultural eutrophication in Eagle Lake, Kandiyohi County, Minnesota. Two non-point nutrient sources were identified: agricultural runoff and domestic sewage. A lake-encircling collection line now diverts the sewage to a treatment plant. Earthen dams with soil absorption fields have been tested as a mean of removing nutrients from part of the watershed runoff. Coincident with initiation of these anti-pollution measures, a comprehensive research project was initiated. Detailed studies of the chemical, physical, and biological conditions in the lake were conducted before the sewage system was completed. Water and nutrient budget estimates have been made. Eagle Lake can be classified as moderately eutrophic. Socio-economic surveys of lakeshore residents, other watershed residents, and non-resident ice fishing users resulted in a base line profile of recreational use of Eagle Lake and of attitudes toward the lake and toward the anticipated improvements. Hopefully these data will suggest a model of community action. These benchmark studies, while of intrinsic interest, will reach their ultimate utility as a reference for comparison with conditions in the watershed after the pollution control measures have been in operation. Such future studies are anticipated.
W77-02215

A COMPREHENSIVE SYSTEMS ENGINEERING STUDY OF THE TRUE ECONOMIC VALUE OF UNPOLLUTED WATER VERSUS VARYING DEGREES OF POLLUTED WATER,
Rhode Island Univ., Kingston. Dept. of Mechanical Engineering and Applied Mechanics.
C. D. Nash, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 493, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, (1976). 20 p, 91 ref. OWRT A-057-RI(1). 14-31-0001-4040.

Descriptors: Costs, *Systems analysis, Water pollution, Potable water, *Cost comparisons, Cost analysis, *Pollution taxas(Charges), *Water costs.
Identifiers: *Water pollution costs.

True costs associated with water pollution are described. Offset costs are included. Total water pollution cost is specified as including cleanup costs, industrial use costs, recreational use costs, health costs, and esthetic costs. A new concept is introduced of using the offset costs of pollution as a basis for setting tariffs to place competition between domestic and foreign companies on an equal global pollution basis.
W77-02220

THE ROLE OF MOLLUSKS AS BENTHOS COMPONENTS IN PURIFICATION OF WATER BODIES FROM ASCARIS SUUM EGGS, (IN RUSSIAN),
Chelyabinsk Meditsinskii Institut (USSR).
S. E. Asitinskaya.
Parazitologiya (Leningr) 9(5), p 432-433, 1975.

Descriptors: *Mollusks, *Benthos, *Water purification.
Identifiers: *Ascaris-Suum eggs, Bithynia-tentaculata, Galba-palustris, Radix-auricularia, Radix-lagotis, Radix-ovata, Radix-periger.

Fresh water mollusks Galba palustris and Bithynia tentaculata feed on Ascaris eggs, destroy them (10-20%) and hinder their development as compared to controls. These mollusks participate in the purification of water bodies from Ascaris eggs. Eggs swallowed by the mollusks Radix ovata, R. periger, R. auricularia, R. lagotis develop normally. Radix serve to scatter eggs over the bottom of the water body.--Copyright 1976, Biological Abstracts, Inc.
W77-02230

SOME HYGIENIC PROBLEMS RELATED TO THE USE OF HERBICIDES OF THE 2,4-DICHLOROPHENOXYACETIC ACID GROUP, (IN RUSSIAN),
Tomsk Meditsinskii Institut (USSR).
V. P. Paderova.
Gig Sanit 9, p 96-97, 1975.

Descriptors: *Herbicides, Public health, Trees, *Acids, *2-4-D, Chemcontrol, *Weed control, Shrubs, Organic acids, Vegetation, Water pollution sources.
Identifiers: *Acetic acids.

Herbicides (derivatives) of the 2,4-D group used for chemical weeding and eradication of undesirable trees and shrubs enter into surface waters and aquifers. The entry of the herbicides into water sources depends on the relief, meterological conditions and other factors. Maximum contamination of water sources occurs with the use of large doses of the herbicides for eradicating trees and shrubs in the immediate vicinity of surface waters.--Copyright 1976, Biological Abstracts, Inc.
W77-02231

EFFECT OF MINE WASTEWATERS ON THE WATER QUALITY OF THE OL'KHOVOYE RESERVOIR, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W77-02242

EVALUATION OF METHODS OF RECOVERING PATHOGENIC INTESTINAL MICROORGANISMS FROM WATER, (IN RUSSIAN),
Gorodskaya Sanitarno-Epidemiologicheskaya Stantsiya, Moscow (USSR).
For primary bibliographic entry see Field 5F.
W77-02244

THE ROLE OF SILT IN ERADICATION OF ONCOMELANIID SNAILS IN GRASSY BEACHES, (IN CHINESE).
Acta Zool Sin 21(2), p 125-126, 1975.

Descriptors: *Silts, Silting, *Snails, Beaches, Asia, Floods.
Identifiers: *China, *Oncomelaniid snails, *Schistosoma.

Oncomelaniid snails (intermediate hosts of Schistosoma) in Chung-chou, Chien-li Hsien, China, were greatly reduced after the 130-150th day of immersion in water of the area during a 1973 flood. Silt released by a rush of water effectively reduced the number of oncomelaniid snails.--Copyright 1976, Biological Abstracts, Inc.
W77-02245

PARROT'S-FEATHER (MYRIOPHYLLUM AQUATICUM (VELL.) VERDC.), AN AGGRESSIVE WATER WEED IN PORTUGAL, (IN PORTUGUESE),
Estacao Agronomica National, Oeiras (Portugal).
A. N. Teles, and A. R. Pinto Da Silva.
Agron Lusit 36(3), p 307-324, 1975.

Descriptors: *Aquatic weeds, Europe, *Aquatic weed control, Water pollution control, Chemcontrol, Fertilizers.
Identifiers: Myriophyllum-aquaticum, *Parrotsfeather, *Portugal, River Tagus(Portugal).

The occurrence of M. aquaticum in Portugal was announced in 1961. However, collections of this plant in NW and central localities date from 1936 and 1953. The available data from herbaria and direct searching indicate that the strongest and most aggressive infestation occurs in ditches and small rivers with reduced flow in the lower valley of the River Tagus in Ribatejo province. A revision of control procedures is given and the possibilities of the utilization of this water weed as an additional source of feedstuffs and as a fertilizer to offset the costs of mechanical removal of the plants and their use in stripping nutrients from excessively eutrophic waters are discussed. Chemical analyses concerning Portuguese plants are presented and compared with those of other aquatic species.--Copyright 1976, Biological Abstracts, Inc.
W77-02247

MAXIMUM ALLOWABLE CONCENTRATION OF LEAD IN SURFACE WATERS, (IN RUSSIAN),
Sverdlovsk Research Inst. of Industrial Hygiene and Occupational Disease (USSR).
For primary bibliographic entry see Field 5C.
W77-02262

DYNAMICS OF THE CONTENT OF SOME ORGANIC TOXIC SUBSTANCES IN PLANTS IRRIGATED WITH EFFLUENTS OF THE COAL-TAR CHEMICAL INDUSTRY, (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
For primary bibliographic entry see Field 5C.
W77-02263

HYGIENIC STANDARDIZATION OF OCTYLIC STABILIZERS OF POLYVINYLCHLORIDE IN WATER BODIES, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
O. V. Golovanov.
Gig Sanit 5, p 36-39, 1975.

Descriptors: *Water quality standards, *Chlorides, Public health, Organic compounds, *Lethal limit, Rodents.
Identifiers: *Polyvinylchlorides, *Octylic stabilizers.

The threshold concentrations (TC) of diisobutylmaleatedioctylin (DIBMDP) and ethylenbisthioglycolatedioctylpewter (EBTGDP) according to the organoleptic indiced of noxiousness amount of to 0.1 mg/kg. Judging by the effect produced on the sanitary regimen of water bodies the TC of DIBMDP equals 0.6 mg/l and that of EBTGDP 0.01 mg/l. The ineffective dose of DIBMDP in a chronic sanitary-toxicologic experiment amounts to 0.001 mg/kg and that of EBTGDP to 0.0001 mg/kg, which is equivalent to their concentrations in water at levels of 0.02 and 0.002 mg/l. These are the recommended maximal permissible concentrations for water bodies. (Experiments were conducted on rats, rabbits and guinea pigs.)--Copyright 1976, Biological Abstracts, Inc.
W77-02264

EXPERIMENTAL STUDY OF SAFE LEVELS OF THE HERBICIDES LINURON AND DICHLORPHENYLOXYUREA IN WATER BODIES, (IN RUSSIAN),
Meditsinskii Institut, Saratov (USSR).
N. N. Mironenko.
Gig Sanit 7, p 46-49, 1975.

Descriptors: *Herbicides, Toxicity, *Lethal limit, *Legislation, *Water quality standards, Rodents, Ureas.
Identifiers: *Linuron, *Dichlorophenylurea, USSR.

On the basis of sanitary-toxicologic experiments using mice, rats and rabbits, the suggested maximal permissible concentrations in water bodies are 1.0 mg/l for linuron and 0.8 mg/l for dichlorphenyloxyurea (an intermediate in linuron production). These standard levels were approved by legislation. (The sanitary-toxicologic index of noxiousness is mentioned.)--Copyright 1976, Biological Abstracts, Inc.
W77-02265

STATE CONSIDERATION OF THE RIVERS ZETA AND MORACA BASED ON THE CHEMICAL CONTROL, (IN SERBO-CROATIAU),
Meditsinskii Institut, Titograd (Yugoslavia).
S. Filipovic.
Glas Repub Zavoda Zast Prir Titograd, 8, p 151-159, 1975. (English summary).

Descriptors: *Chem control, *Sampling, Industrial wastes, Sewage, Europe, *Water pollution control, *Pollution abatement.
Identifiers: *Yugoslavia, Zeta River(Yugoslavia), Moraca River(Yugoslavia).

From Apr. 11, 1973-Nov. 7, 1974, samples were taken from sewage and industrial waste discharge areas in the Zeta and Moraca rivers (Yugoslavia). The chemical parameters were studied and the results are presented.--Copyright 1976, Biological Abstracts, Inc
W77-02266

MEASURES FOR THE PROTECTION OF THE RIVERS ZETA AND MORACA, (IN SERBO-CROATIIAU),
Zavod za Zastitu Prirora, Titograd (Yugloslavia).
K. Zunjic.
Glas Repub Zavoda Zast Prir 8, p 161-167, 1975.

Descriptors: Water pollution sources, *Water pollution control, *Pollution abatement, Rivers, Water supply, Europe, Regulation.
Identifiers: *Yugoslavia, Zeta River(Yugoslavia), Moraca River(Yugoslavia).

The first signs of pollution of the Zeta and Moraca rivers (Yugoslavia) are reported. The quantity and quality of waste waters from the most common pollution sources were determined. Pollution control measures are described.--Copyright 1976, Biological Abstracts, Inc.
W77-02267

SANITARY-HYGIENIC ASPECTS OF THE USE OF NEW PREPARATIONS FOR CONTROLLING SEEPAGE IN WATER BODIES, (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
For primary bibliographic entry see Field 4A.
W77-02269

WAYS OF PREVENTING THERMAL POLLUTION OF WATER BODIES BY WASTEWATERS OF NUCLEAR POWER PLANTS, (IN RUSSIAN),
A. N. Marei.
Gig Sanit 11, p 83-86, 1975.

Descriptors: *Thermal pollution, *Nuclear powerplants, Water pollution control, *Pollution abatement, Water quality standards, *Cooling towers, *Mixing, Legislation.
Identifiers: *USSR water pollution legislation.

Nuclear power plants are a potential source of thermal water pollution. To regulate temperature in natural water bodies, Soviet legislation established standards allowing its summer increase by no more than 3C. Observance of this requirement can be provided in 2 basic ways. The first is to accelerate the mixing of thermal discharges with the entire water mass, mainly by using the hydrologic factor. Its effectiveness depends primarily on the relationship of the wastewater discharge and river discharge. In Soviet practice this method as a rule is not used. The second method is to localize the thermal waters in the region of their occurrence and cool them in closed circulating water supply systems. At comparatively small nuclear power plants this is achieved by cooling towers and at new, larger plants by a system of artificial cooling ponds.--Copyright 1976, Biological Abstracts, Inc.
W77-02271

RATE OF DISSOLUTION OF PHOSPHATE FROM MINERALS AND SOILS,
Montana State Univ., Bozeman. Dept. of Chemistry.
For primary bibliographic entry see Field 2G.
W77-02275

EFFECTS OF WATERHYACINTH COVER ON WATER CHEMISTRY, PHYTOPLANKTON, AND FISH IN PONDS,
Auburn Univ., Ala. Dept. of Fisheries and Allied Aquacultures.
C. McVea, and C. E. Boyd.
Journal of Environmental Quality, Vol. 4, No. 3, 1975. p 375-402, 5 tab, 27 ref.

Descriptors: *Water hyacinth, Aquatic life, *Water chemistry, *Aquatic weeds, Water quality, Fish, Ponds, Pondweeds, Phosphorus, *Phytoplankton, Aquatic weed control.

Waterhyacinth cover of 0, 5, 10, or 25% surface was established in fertilized ponds stocked with the fish, Tilapia aurea, at Auburn, Alabama. Measurements of water chemistry, phytoplankton density, and fish production were made during the 1973 growing season. Phytoplankton production was less in ponds with 10 and 25% cover by waterhyacinth than in ponds with 0 and 5% cover. Competition of waterhyacinth with phytoplankton involved shading and removal of phosphorus from the water. Concentrations of dissolved oxygen were lowest in ponds with 25% cover, but oxygen tensions in all ponds were adequate for survival and growth of fish. Reduction in phytoplankton growth in ponds with 10 and 25% cover resulted in much lower fish prodcution. The presence of 5% cover by waterhyacinth did not significantly affect fish production. (Skogerboe-Colo St)
W77-02291

A COMPARISON OF NITROGEN, PHOSPHORUS, AND CARBON IN SEDIMENTS AND SOILS OF CULTIVATED AND NONCULTIVATED WATERSHEDS IN THE NORTH CENTRAL STATES,
Agricultural Research Service, Oxford Miss.
J. C. Ritchie, A. C. Gill, and J. R. McHenry.
Journal of Environmental Quality, Vol. 4, No. 3, 1975. p 339-341, 5 tab, 12 ref.

Descriptors: *Nitrogen, *Phosphorus, *Carbon, *Return flow, Water quality, Sediments, Nutrients, Nutrient removal, Cultivation, Cultivated lands, Watersheds(Basins), Central US.

Soil and sediments from six cultivated watersheds and from six noncultivated watersheds were sampled and the concentration of nitrogen, phosphorus, and carbon was determined. No significant difference was found in the concentration of N, P, or C with depth in the soils or sediments. Concentration of N,P, and C were not significantly different in the soils and sediments of the cultivated watersheds; however, the sediments of the noncultivated watersheds had significantly less N and organic P than the watershed soils. Less accumulation of N,P, and C is occurring in the noncultivated watershed sediments than in the cultivated watershed sediments. These data indicate that sediment source is probably an important factor in determining N,P, and C concentration in reservoir sediments. (Skogerboe-Colo St)
W77-02292

COMPARISON OF METHODS FOR THE DETERMINATION OF TOTAL PHOSPHORUS IN WATERS CONTAINING PARTICULATE MATERIAL,
Massey Univ., Palmerston North (New Zealand). Dept. of Soil Science.
For primary bibliographic entry see Field 5A.
W77-02293

THE DISTRIBUTION OF TWO MOSQUITO-LARVIVOROUS FISHES, GAMBUSIA AFFINIS AND ORYZIAS LATIPES, IN THE TOKYO METROPOLITAN AREA, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Parasitology.
Y. Wada, Y. Sawara, J. Niiyama, Y. Fukabori, and Y. Nakamura.
Jpn J Sanit Zool. 25(3), p 285-288, 1974.

Descriptors: *Ecological distribution, *Distribution, *Fish, *Streams, *Ditches, *Swamps, Surface waters, Water pollution, Rivers, Sewage, Ponds.
Identifiers: Gambusia affinis, Japan, *Medaka, Oryzias latipes, Tokyo, *Topminnow, *Mosquito fish, Rice paddies, Kanto plain, *Bay of Tokyo, Yokohama, Chiba.

The distribution (in the Tokyo Metropolitan area; Kanto Plain) of the 2 mosquito-larvivorous fishes, G. affinis (top minnow or mosquito fish) and O. latipes (medaka) was studied by direct inspection and from the response to questionnaires sent to 859 middle schools in the prefectures of Gumma, Tochigi, Ibaraki, Saitama, Chiba, Kanagawa and Tokyo, Japan. G. affinis is a poeciliid ovoviviparous fish introduced into Japan in 1916 from southern USA via Hawaii and Taiwan for malaria control, and was noted recently to be distributed in rather polluted waters in and around the city of Tokyo, whereas, O. latipes is a native fish widely distributed in streams and ditches containing cleaner water. G. affinis was found in ditches and swamps in the more urbanized areas near the coast of the Bay of Tokyo, especially in the cities of Tokyo, Yokohama and Chiba, and also in the areas north of Tokyo lined by the Rivers Arakawa and Furutonegawa, where the waters were more or less polluted by sewage. Sporadic distributions of this species were noted in the ponds in Tokyo, Utsunomiya and Tsuchiura where the fish had been introduced artificially. O. latipes was found in the rural areas surrounding these large cities, particularly in rice paddies and streams in Kanagawa, Saitama, Gunma, Tochigi, Ibaraki and Chiba Prefectures. (Large numbers of Gambusia were observed inhabiting the Bay of Tokyo near the wharf of Tokyo Harbor; it is probably established in a number of canals along the Bay shore.)--Copyright 1975, Biological Abstracts, Inc.
W77-02297

PROJECT DEVELOPMENT AND DATA PROGRAMS FOR ASSESSING THE QUALITY OF THE WILLAMETTE RIVER, OREGON,
Geological Survey, Portland, Oreg. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-02301

SELECTION OF STREAMFLOW AND RESERVOIR-RELEASE MODELS FOR RIVER-QUALTIY ASSESSMENT,
Geological Survey, Jackson, Miss.; and Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 2A.
W77-02302

PRELIMINARY SELECTION OF STORM-WATER BASINS SUITABLE FOR INFILTRATION OF RECLAIMED WATER IN NASSAU COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Albany, N.Y. Water Resources Div.
D. A. Aronson.
Open-file report 76-668, May 1976. 39 p, 2 fig, 3 tab, 8 ref.

Descriptors: *Groundwater recharge, *Artificial recharge, *Reclaimed water, *Storm runoff, *Infiltration, Controlled drainage, Water storage, Groundwater availability, Water supply, *New York.
Identifiers: *Nassau County(NY).

A survey was made of 205 storm-water basins south of the ground-water divide and north of Hempstead Turnpike in Nassau County, Long Island, N.Y., to determine which would be best suited for infiltration of reclaimed water. Selection depended on infiltration area, location with respect to the ground-water divide and to planned transmission mains, tendency to retain storm runoff, underlying lithology, and depth to water table. The total maximum infiltration area of 14 selected basins is 60.2 acres, or 2,620,900 square feet (0.24 square kilometers). If 5-foot (1.5-meter) - high partitions were constructed in the basins to divide each into approximately equal halves and reclaimed water were applied in half of each basin to a depth of 5 feet (1.5 meters), using an application-rest cycle, a total area of 25.2 acres (0.10 square kilometers) would be available for supplemental recharge; the remaining infiltration area could be used for disposal of storm runoff. (Woodard-USGS)
W77-02322

ESTUARINE POLLUTION CONTROL: OBJECTIVES AND PRIORITIES,
K. D. Staples.
Proceedings of the Institution of Civil Engineers, Vol. 60, Part 1, p 329-343, August, 1976. 5 fig, 2 tab, 8 ref.

Descriptors: *Estuaries, *Water pollution control, *Hydraulics, *Sewage, *Industrial wastes, Suspended solids, Organic compounds, Heavy metals, Toxicity, Dissolved oxygen, Tidal effects, Control systems, Economics, Aeration, Mathematical models, Surface waters, Effluents.
Identifiers: Great Britain.

The forms and hydraulic regimes of estuaries are described along with the nature and effect of pollutants arising from sewage and industrial waste discharges on developed estuaries. Pollutants contributed to a developed estuary normally include three important elements: suspended solids, dissolved colloidal biodegradable compounds, and dissolved toxic chemicals including heavy metals. The effect of individual pollutants on a particular estuary is dependent on their volume and the estuary regime, particularly the tidal excursion and retention period within the waters. The point of pollutant contribution is important in all cases, with the pollutant's effect being greater at higher points of contribution in the estuary. Where high water quality is desired, a minimum dissolved oxygen level of about 40% is recommended. Mathematical modeling procedures can be used to equate pollutant input with the dilution and transport effected by the tidal flow and the reaeration and oxidation potential of the estuary, thus allowing for the establishment of pollution control policies that minimize expense. The costs of proposed estuary pollution control works for several major British estuaries are compared, and priorities for the staged implementation of typical control schemes are discussed. (Kreager-FIRL)
W77-02343

MINNEAPOLIS-ST. PAUL: LAND OF THE 'SHINING BIG-SEA-WATERS',
Metropolitan Waste Control Commission, St. Paul, Minn.
For primary bibliographic entry see Field 5D.
W77-02351

SURVEYING AMERICA'S LAKES.
For primary bibliographic entry see Field 5C.
W77-02375

TOWARD A MORE MEANINGFUL INDEX OF SLUDGE QUALITY,
Carnegie-Mellon Univ., Pittsburgh, Pa.
B. Fitch, and P. Kos.
Journal Water Pollution Control Federation, Vol. 48, No. 8, p 1979-1987, August, 1976. 11 fig, 1 ref.

Descriptors: *Activated sludge, *Suspended solids, *Physical properties, *Measurement, *Waste water treatment, Biological treatment, Performance, Sludge, Mathematical studies.
Identifiers: Sludge volume index, *Sludge quality index.

A new index of sludge quality which is independent of the concentration and characteristic of solids quality is proposed as a replacement for the conventionally used sludge volume index. The new index of sludge quality accounts for the functional relationship between sludge volume index and suspended solids and is based on the same test data as the sludge volume index. Although the existing procedure for sludge volume index determination correlates reasonably well with settleability when the settled sludge volume is below about 300 cu cm/liter, above that level the sludge volume index is a strong function of suspended solids concentration. The sludge quality index which takes this functional relationship into account thus offers a superior means for characterizing the settleability of activated sludge. When the solids settle to less than about 300 cu cm, the two indices are identical. (Kreager-FIRL)
W77-02378

THE INFLUENCE OF HIGH QUANTITIES OF MANURE ON SOIL WATER, AND PLANTS, (IN GERMAN),
Agricultural Experiment Station, Oldenburg (West Germany).
H. Vetter, and A. Klasink.
Landwirtsch Forsch 28(3), p 249-268, 1975.

Descriptors: *Farm wastes, Soil water, Plant pathology, Waste disposal, Crops, Cattle, Water reuse, Recycling.

Risks of water and soil pollution due to spreading manure in excess are small; only 2% of all livestock farms have excess manure in relation to their cultivated land. Most must use large amounts of mineral fertilizer. When a large region has excess manure, disposal is a problem. The waste disposal law prescribes that land spreading of manure must be controlled when manure application exceeds the usual quantity (the amount produced by 3 cattle equivalents). The allowable quantity of manure may vary between 3 and 6 cat-

de equivalents, depending on soil characteristics and cultivated crops.--Copyright 1976, Biological Abstracts, Inc.
W77-02387

TRACE ELEMENTS IN THE ENVIRONMENT OF SOME GOITER REGIONS OF THE TASHKENT OBLAST, (IN RUSSIAN),
Uzbekskii Nauchno-Issledovatelskii Institut Sanitarii, Gigieny i Profzabolevanii, Tashkent (USSR).
T. I. Vezhnevets, M. M. Baltabaev, and V. N. Zinkina.
Gig Sanit 1, p 101-102, 1975.

Descriptors: *Trace elements, Copper, Cobalt, Zinc, Iodine, Soils, Foods, *Human diseases, Public health, Environment, Distribution.
Identifiers: Goiter region, *Tashkent oblast, USSR, Uzbek-SSR, *Endemic goiter, Biosphere.

The content of trace elements (I, Co, Cu, Zn) in soil, water and food products of 7 regions of the Tashkent oblast, Uzbek SSR, USSR, was studied to establish whether there was a relationship between the distribution of endemic goiter among the population and the quantity of these elements in the biosphere. The population receives an insufficient quantity of I and Co in food.--Copyright 1976, Biological Abstracts, Inc.
W77-02388

OCEAN DUMPING PHASE-OUT IN EPA REGION II,
For primary bibliographic entry see Field 5E.
W77-02393

GAS AND LEACHATE FROM LANDFILLS: FORMATION, COLLECTION, AND TREATMENT. PROCEEDINGS OF A RESEARCH SYMPOSIUM.
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5E.
W77-02394

CURRENT EPA RESEARCH ACTIVITIES IN SOLID WASTE MANAGEMENT,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5E.
W77-02396

CURRENT OFFICE OF SOLID WASTE MANAGEMENT PROGRAMS - LANDFILL ACTIVITIES,
Environmental Protection Agency, Washington, D.C. Office of Solid Waste Management Programs.
For primary bibliographic entry see Field 5E.
W77-02397

CURRENT SOLID WASTE RESEARCH ACTIVITIES IN NEW YORK STATE,
New York State Dept. of Environmental Conservation, N. Y. Div. of Solid Waste Management.
For primary bibliographic entry see Field 5E.
W77-02398

CURRENT SOLID WASTE MANAGEMENT ACTIVITIES IN PUERTO RICO,
Puerto Rico Environmental Quality board, San Juan.
For primary bibliographic entry see Field 5E.
W77-02399

LANDFILL RESEARCH WORK IN PROGRESS AT HARWELLS HAZARDOUS MATERIALS SERVICE,
Atomic Energy Research Establishment, Harwell (England).
For primary bibliographic entry see Field 5E.
W77-02400

KELP HABITAT IMPROVEMENT PROJECT,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Environmental Engineering Science.
For primary bibliographic entry see Field 2L.
W77-02417

ECONOMIC EFFECTS OF ENFORCEMENT VARIABLES ON COMMERCIAL OIL POLLUTION CONTROL STRATEGY,
Naval Postgraduate School, Monterey, Calif.
R. C. Cook.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-016 442, Price codes: A05 in paper copy, A01 in microfiche. MS thesis, September 1975. 91 p. 8 fig., 10 tab., 24 ref., 3 append.

Descriptors: *Oil spills, *Decision making, *Economic justification, *Industries, Oil pollution, Pollution abatement, Model studies, Evaluation, Water pollution control, Law enforcement, Costs, Penalties(Legal), Management, Attitudes.
Identifiers: *Microeconomic decision model, Pollution control inducement, Corporate behavior.

The decision making process of firms engaged in potentially oil polluting activities is analyzed in an effort to isolate the effects of penalties and other pollution costs which may motivate pollution control. An economic decision model for oil pollution control strategy is developed on the basis of 1973 and 1974 data taken from the Coast Guard's Pollution Incident Reporting System. The model and analysis breakdown the major internal and external decision parameters and show the impact of civil penalties, cleanup costs, and internal costs on a firm's pollution control strategy. Civil penalties appear to be most effective in controlling minor spills, since the costs of product lost and expected cleanup are small relative to the penalties. As the spills increase in size, costs of cleanup and loss of product become much more important while the civil penalty becomes negligible. Cleanup costs have a significant impact on the decision in that they account for the largest portion of the external costs that the firm must internalize. However, application of the model to large scale spills reveals that the firm's internal costs have the largest influence on its pollution control strategy. This model may be extended into other areas such as fisheries enforcement, other forms of pollution control, and government intervention and regulation. (Luedtke-Wisconsin)
W77-02418

SALT MARSH ESTABLISHMENT AND DEVELOPMENT,
Environmental Concern, Inc., St. Michaels, Md.
For primary bibliographic entry see Field 4D.
W77-02420

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: THE TEXTILES, FRICTION AND SEALING MATERIALS SEGMENT OF THE ASBESTOS MANUFACTURING INDUSTRY,
Little (Arthur D.), Inc., Cambridge, Mass.
S. V. Margolin, and B. U. N. Igwe.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 683, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-230-2-74-030, July 1975. 72 p. 2 fig, 16 tab. 18, 68-01-1541.

Descriptors: *Economic impact, *Water pollution control, *Asbestos, *Standards, Sealants, Costs, Capital costs, Annual costs, Prices, Pricing, Employment, Foreign trade, Investment, Profits, Industrial plants, Industrial wastes, Industrial production, Pollution abatement.
Identifiers: *Asbestos manufacturing industry, *Effluent standards, Gaskets, Friction materials, Asbestos textiles.

This study supplements the EPA Effluent Limitations Guidelines analysis for the textiles, friction, and sealing materials segment of the asbestos product manufacturing industry by estimating the broader economic effects of the application of required effluent treatment technologies. None of the 75 plants in this segment of the industry was judged to be in danger of production curtailment or plant closure due to the imposition of the proposed standards. Only one sheet gaskets manufacturing plant is expected to incur additional costs ($80,300 incremental capital expenditures and annual water treatment costs of $35,500) to comply with the Best Practicable Technology standards. To meet the Best Available Technology (BAT) criteria, the above plant and four friction materials manufacturing plants are expected to incur total additional capital costs of $632,500 and annual water treatment costs of $139,200. No prices increases are predicted, with the exception of a 1% rise in the friction materials group as a result of BAT standards. Furthermore, no adverse impacts are expected on production and market growth or the historically favorable balance of payments position with respect to these products. 'New Source Performance Standards' are not expected to deter investments in new facilities. (Luedtke-Wisconsin)
W77-02422

ENERGY DEVELOPMENT: THE ENVIRONMENTAL TRADEOFFS. VOL. 2: RELATIVE ENVIRONMENTAL ASSESSMENT OF METHODS TO INCREASE ENERGY PRODUCTION, CRUDE OIL, PIPELINE QUALITY GAS, AND ELECTRICITY FROM WESTERN COAL,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 6G.
W77-02423

ATLANTIC OFFSHORE OIL: THE NEED FOR PLANNING AND REGULATION,
Woods Hole Oceanographic Institution, Mass. Marine Policy and Ocean Management Program.
For primary bibliographic entry see Field 6G.
W77-02426

ENERGY FROM COAL.
Tetra Tech, Inc., Arlington, Va.
For primary bibliographic entry see Field 6D.
W77-02430

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE PHOSPHORUS DERIVED CHEMICALS SEGMENT OF THE PHOSPHATE MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
E. E. Martin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-241 018, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA-440/1-74-006-a, January 1974. 161 p. 12 fig., 20 tab., 73 ref.

Descriptors: *Standards, *Effluents, *Chemical industry, *Phosphorus compounds, *Technology, Recycling, Pollutants, Capital costs, Federal Water Pollution Control Act, Annual cost, Waste water treatment, Industrial wastes, Economic impact.
Identifiers: *Effluent guidelines, *Zero discharge, Phosphoric acid, Phosphorus pentoxide, Phosphorus pentasulfide, Sodium tripolyphosphate, Calcium phosphates, Ferrophosphorus, Phosphorus trichloride, Phosphorus oxychloride, Phosphate manufacturing industry.

Effluent limitation guidelines and new source performance standards for the phosphate manufacturing industry to be achieved by July 1, 1977 and July 1, 1983 were developed. The phosphorus production subcategory of the industry is characterized by large quantities of raw process wastes, including highly deleterious phossy water and highly acidic scrubber and quenching waste waters. However, through the use of in-process and end-of-process controls, production plants currently demonstrate abatement practices resulting in 97% or greater reduction in the raw waste load before discharge, and the total recycle of process water without any discharge has been demonstrated using the best practicable control technology, essentially solving the most serious raw waste problem in the industry. The phosphorus-consuming subcategory, while consisting of essentially dry processes, uses water for air pollution abatement, cleaning and washing containers, and transferring the raw material, all resulting in acidic or phossy waste water. Sufficient reduction of effluents has not yet been achieved in this portion of the industry, but currently available technology exists to either recycle or neutralize and remove these wastes. Currently available practicable technology to achieve zero discharge also exists for the phosphate segment of the industry, though outside contamination may prevent reuse of food grade calcium phosphate waste waters. (Luedtke-Wisconsin)
W77-02431

ENVIRONMENTAL TRUST FUNDS: AN EVALUATION,
RIVUS, Inc., Glen Burnie, Md.
W. Smith, D. Hale, M. Rose, and J. Goldstein.
Available from the National Technicial Information Service, Sprirgfield, VA 22161 as PB-251 306, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA-230/3-76-002-append. D, July 1974. 122 p. 9 fig., 34 ref., 2 append. 68-01-2462.

Descriptors: *Evaluation, *Financing, *Treatment facilities, *Sewage treatment, *Construction costs, Federal Water Pollution Control Act, Government finance, Economic efficiency, Pollution abatement, Equity, Economic feasibility, Income distribution.
Identifiers: *Trust funds, *Construction Grant Program, Financing alternatives.

Economic, fiscal legal, administrative, and institutional aspects of alternate financing arrangements for pollution abatement under the Federal Water Pollution Control Act Amendments are investigated, with particular emphasis on the utilization of trust funds. Six alternate financing arrangements for the Construction Grant Program are examined and three alternative arrangements are considered: earmarking benefit-related taxes, rate set by Congress; and earmarking benefit-related taxes, rate set by formula. In addition, the program's current financing arrangements and two unconventional options, open trust funds and off-budget financing, are illustrated. Evaluation criteria include efficiency, equity, income distribution, effectiveness, and feasibility. It is concluded that while the existing financial arrangement may be deficient in the economic efficiency and equity areas, it is effective in generating an adequate supply of funds. Its replacement by an environmental trust fund would not result in any net advantage; while it would offer a coherent framework for consideration of all program aspects under one title, it would also worsen certain economic effects of the program. If a trust fund arrangement were to be implemented, it may incorporate benefit-related taxes, have advantages from the standpoints of equity, income distribution, allocational efficiency, and use debt receipts to finance grants. (Luedtke-Wisconsin)
W77-02432

GROUNDWATER AND GROUNDWATER LAW IN MASSACHUSETTS.
Massachusetts Commonwealth Div. of Water Resources, Boston.
For primary bibliographic entry see Field 4B.
W77-02437

NITRATE REMOVAL FROM WATER AT THE WATER-MUD INTERFACE IN WETLANDS,
Louisiana Agricultural Experiment Station, Baton Rouge.
W. H. Patrick, Jr, R. D. Delaune, R. M. Engler, and S. Gotoh.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 791, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-600/3-76-042, April 1976. 87 p. 25 fig., 5 tab., 22 ref. XH1627, R-800428.

Descriptors: *Nitrates, *Denitrification, *Wetlands, *Oxidation-reduction potential, Oxygen, *Mud-water interfaces, *Louisiana, Swamps, Salt marshes, Flooding, Rice, Manganese, Iron, Sulfur, Ammonia, Nutrient removal.

Flooded swamp and coastal marsh soils in Louisiana have a high capacity for nitrate reduction, according to research focused: (1) on learning how rapidly, how completely and by what mechanism nitrate is removed by biological reduction from shallow surface water in swamps, marshes and flooded soils, and (2) to determine the oxidation-reduction properties of the water-mud interface that control or influence the reduction of nitrate to nitrogen gas. Oxidized and reduced layers in flooded soil were differentiated according to the vertical distribution of the oxidation-reduction (redox) potential and concentrations of manganous manganese, ferrous iron, sulfide, nitrate and ammonium. Redox potential was measured with a special motor-driven assembly which pushed a platinum electrode through a soil sample at a steady rate. From laboratory experiments, it was found that nitrate added to shallow floodwater rapidly disappeared, oxygen loss from sedimets occurred rapidly and nitrate reduction was not inhibited by up to 16 ppm oxygen dissolved in soil suspensions. The nitrate was not reduced in the floodwater but filtered downward into the anaerobic soil layer. Additions of organic matter to a mineral soil flood for rice culture decreased the thickness of the aerobic-anaerobic zone at the soil-water interface and increased the rate of nitrate reduction. (Harris-Wisconsin)
W77-02441

STUDIES ON LAKE RESTORATION BY PHOSPHORUS INACTIVATION,
Corvallis Environmental Research Lab., Oregon.
W. D. Sanville, A. R. Gahler, J. A. Searcy, and C. F. Powers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 435, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-600/3-76-041, April 1976. 53 p. 21 fig., 2 tab., 17 ref. 1BA608.

Descriptors: *Nutrient removal, *Sodium compounds, Lakes, Water quality, Phosphates, Chemicals, Chemical reactions, Phosphorus, Cyanophyta, Chlorophyta, Ammonia, Standing crops, Productivity, Iron, Manganese, Dissolved oxygen, Acidity.
Identifiers: *Lake restoration, *Nutrient inactivation, *Sodium aluminate, *Phosphorus inactivation, Cline's Pond(Or.), Kjeldahl nitrogen.

Sodium aluminate had at least partial effectiveness as an agent of nutrient inactivation in an attempt to control and reduce eutrophication of a farm pond, although firm conclusions about the effectiveness of the treatment could not be drawn because of a lack of uniformity of limnological parameters in the pond during the two-year period preceding the start of the experiment. Data was sought at Cline's Pond near Corvallis, Oregon on the ability of sodium aluminate to scavenge phosphate in the water column, to prevent resolubilization of phosphate and to inhibit primary production. In general, two years after inactivation there was a lessening of total phosphate, ammonia, total Kjeldahl nitrogen, iron, manganese and the algal standing crop. Other results were increased transparency, a more uniform distribution of dissolved oxygen and a shift in dominance from blue-green to green algae. The method seems promising for eutrophication reduction where the lake lacks significant flowthrough and where nutrient influx can be controlled. However, use of the technique must first be more fully evaluated because of short-comings in present knowledge about long-range environmental effects of sodium aluminate. (Harris-Wisconsin)
W77-02442

STRIP-MINING TECHNIQUES TO MINIMIZE ENVIRONMENTAL DAMAGE IN THE UPPER MISSOURI RIVER BASIN STATES,
Bureau of Mines, Denver, Colo. Intermountain Field Operation Center.
F. H. Persse.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 843, Price codes: A04 in paper copy, A01 in microfiche. Information Circular 8685, September 1975. 58 p. 11 fig., 9 tab., 18 ref., 3 append.

Descriptors: *Strip mines, *Land reclamation, Coals, Lignite, Equipment, Montana, North Dakota, Wyoming, Mining, Water pollution, Air pollution, Pollution abatement, Excavation, Costs, Land use, Geology, Climates, Revegetation, Environmental effects, Earth handling equipment, *Missouri River.
Identifiers: *Upper Missouri River Basin States.

Geology, climate, and current land use information in the Upper Missouri River Basin are presented to assist strip mining and strip mining land reclamation operations. Proven methods of air and water pollution control and mined land restoration are described along with untried methods and equipment for land reclamation. The semi-arid climate of the Upper Missouri River Basin necessitates suppression of dust for the well-being of both men and machinery. However, current air pollution control methods are expected to satisfy these needs in most instances. The prevention of water pollution at coal and lignite operations generally would include diverting surface water from the working area without increasing sedimentation or dissolved salt content, measuring all water entering and leaving the mine area, and constructing a settling basin for mine water containing sediments, which are to flow into a water course. Reclamation of strip-mined land will require a greater annual expenditure than that for air or water pollution control. Unit reclamation costs for the thick deposits are expected to be less than in other parts of the nation. These costs are part of the production costs and should be borne by the ultimate consumer. (Luedtke-Wisconsin)
W77-02445

NATIONAL ENVIRONMENTAL STATISTICAL REPORT,
Mitre Corp., McLean, Va.
For primary bibliographic entry see Field 7C.
W77-02447

WATER HYACINTHS AND ALLIGATOR WEEDS FOR REMOVAL OF LEAD AND MERCURY FROM POLLUTED WATERS,
National Space Technology Labs., Bay St. Louis, Miss.
B. C. Wolverton, and R. C. McDonald.
Available from the National Technical Information Service, Springfield, VA 22161 as N75 22937, Price codes: A02 in paper copy, A01 in microfiche. NASA TM-X-72723, April 1975. 12 p. 8 fig., 4 tab., 14 ref. RTOP 644-02-02.

Descriptors: *Alligatorweed, *Water hyacinth, *Water pollution control, *Heavy metals, Mercury, Lead, Metals, Toxicity, Water pollution sources, Absorption.

Alligator weeds and water hyacinths have demonstrated ability to rapidly absorb mercury and lead from rivers and distilled waters contaminated with these substances, raising the possibility that the method may be used as a means of controlling water pollution by toxic metals which, unlike most organic substances, are not degradable by natural processes. In a 24-hour period, water hyacinths in a laboratory experiment removed 0.176 mg of lead and 0.150 mg of mercury from a static water system per gram of dry plant material. During a similar period, alligator weeds removed 0.101 mg of lead per dry material gram, and reduced initial mercury levels of 0.875 ppm in river water and 0.920 ppm in distilled water below the detection limit of 1.0 ppb after six hours. Extrapolations of these results project a removal potentiality of 105.6 grams of lead and 90.0 grams of mercury per day with one hectare of water hyacinths, and a removal potentiality of 0.153 mg of mercury per gram of dry plant material with the alligator weeds in a six-hour period. The removal rate for the lead is projected on a basis of continual harvesting of the metal-saturated water hyacinths. Further research is in progress to evaluate the ability of the two plant species to remove other heavy metals as well as organic pollutants and nutrients. (Harris-Wisconsin)
W77-02450

NUTRITIONAL ECOLOGY OF NUISANCE AQUATIC PLANTS,
Wisconsin Univ., Madison. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W77-02451

ELASTIC-PLASTIC STABILITY ANALYSIS OF MINE-WASTE EMBANKMENTS,
Bureau of Mines, Spokane, Wash. Spokane Mining Research Center.
For primary bibliographic entry see Field 8D.
W77-02502

USE OF PLANT PATHOGENS FOR BIOREGULATION OF AQUATIC MACROPHYTES,
Florida Univ., Gainesville. Dept. of Plant Pathology.
T. E. Freeman, R. Charudattan, and K. E. Conway.
In: Proceedings of a Symposium on Water Quality Management Through Biological Control, January 1975, p 20-23. 4 fig, 10 ref. OWRT A-027-FLA(7), 14-31-0001-5009.

Descriptors: *Biocontrol, Aquatic weeds, Plant pathology, *Aquatic weed control, Aquatic plants.
Identifiers: *Macrophytes, *Plant pathogen.

In a recent article in Weed Science enumerating the present status of projects on biological control of weeds in the United States and Canada, 75 plant species were listed as being under investigation as targets for biological control (Goeden et al. 1974). Out of this number, only five were included in programs investigating plant pathogens as biocontrol agents. Four out of the five were aquatic weeds under investigation at the University of Florida. Until the program was begun, surprisingly little consideration had been given plant pathogens as biological control agents for aquatic weeds. In fact, as pointed out in the review by Zettler and Freeman (1972), aside from some limited work in India conducted with PL 480 funds, all aspects of the study of diseases affecting aquatic plants had been virtually ignored. Certainly, aquatic plants are affected by diseases and, most certainly, plant pathogens have several desirable characteristics that make them ideal candidates for biological control agents. (Morgan-Florida)
W77-02514

ENVIRONMENT AND POLLUTIONS. SOURCES, HEALTH EFFECTS, MONITORING AND CONTROL,
F. Leh, K. V. Lak, and K. C. Richard.
Charles C. Thomas, Publishers: Springfield, Ill., 1974. 288 p, $14.75.

Descriptors: Environment, Water pollution, *Monitoring, Public health, Chemicals, Fertilizers, Air pollution, *Water quality standards, Pesticides, Industrial wastes, *Pollutant identification.

Global environmental problems are discussed and current information is reviewed in this monograph which is intended for college level students and researchers involved in environmental studies. The origins of current pollution problems are examined and followed by discussions on air pollution with topics on photochemical smog; sulfur compounds in the atmosphere; effects of air pollutants on vegetation, animals an man; global effects of air pollution; economic aspects of air poliffution; quantitative analysis of NO2, ozone, peroxyacyl nitrates, CO and hydrocarbons; and control of nitrogen oxides and sulfur emissions. The 2nd half of the text focuses on water pollution and covers: trace elements such as Hg, Pb, Cd, Co and Cu; pesticides and their biological effects; use of fertilizers; and determination of trace metals and organic chemicals. Removal of heavy metals, organic compounds, P and N are dealt with in the discussion on wastewater treatment. State air quality standards for gases, dusts and mists; maximum safe concentrations for trace metals; criteria for pesticides and herbicides in public water supplies; and, W H O standards in public water supplies are outlined in the appendices. Researchers, instructors and students will find this book valuable.--Copyright 1975, Biological Abstracts, Inc.
W77-02521

SOIL WARMING WITH POWER PLANT WASTE HEAT IN GREENHOUSES,
Oregon State Univ., Corvallis. Dept. of Soil Science.
L. Boersma, and K. A. Rykbost.
HortScience, Vol. 10(1), p. 28-30, February 1975. 3 tab, 9 ref. OWRT B-039-ORE(2).

Descriptors: *Soil temperature, *Heated water, Thermal pollution, Soil treatment.
Identifiers: Waste heat, *Soil warming.

A subsurface soil warming system consisting of parallel line heat sources, buried 52 cm deep and 122 cm apart, simulating a proposed arrangement for the use of power plant waste heat, was installed in a plastic covered greenhouse. Soil warming with a heat source temperature of about 36C increased soil temperatures substantially but had little effect on the air temperature.
W77-02526

EVALUATION OF CERCOSPORA RODMANII AS A BIOLOGICAL CONTROL OF WATER-HYACINTHS,
Florida Univ., Gainesville. Dept. of Plant Pathology.
K. E. Conway.
Phytopathology, Vol. 66, No. 7, p 914-917, July 1976. 8 fig, 8 ref. OWRT A-033-FLA(1). 14-34-0001-7019.

Descriptors: *Biocontrol, Aquatic weeds, *Plant pathology, Waterhyacinth, *Aquatic weed control, *Florida, *Aquatic fungi, Reservoirs.
Identifiers: *Cercospora rodmanii, Rodman Reservoir(Fla).

A fungus, Cercospora rodmanii Conway, which was isolated from declining waterhyacinths in Rodman Reservoir in Florida, was evaluated for its biological control potential on waterhyacinths during two growing seasons (February-November). Results of greenhouse and field studies indicated that the fungus was responsible for the waterhyacinth decline. Infection was initiated on waterhyacinths in Lake Alice on the University of Florida campus during September and October, 1974. A combination of conidia and mycelia was applied to the plants. When the inoculum level was increased by a second similar spray application the disease spread rapidly. Browning of the waterhyacinths in the test pool was augmented in the later stages of the test by below-freezing temperatures. Cercospora rodmanii can be a virulent pathogen on waterhyacinth and its effect on field populations of waterhyacinth will be evaluated further to quantify damage to the plant. (Morgan-Florida)
W77-02528

OLD ANSWERS TO 'NEW' PROBLEMS: HENRY GEORGE, PROPERTY RIGHTS AND ENVIRONMENTAL QUALITY,
Clemson Univ., S.C.
For primary bibliographic entry see Field 6B.
W77-02539

CERCOSPORA RODMANII, A NEW PATHOGEN OF WATER HYACINTH WITH BIOLOGICAL CONTROL POTENTIAL,
Florida Univ., Gainesville. Dept. of Plant Pathology.
K. E. Conway.
Canadian Journal of Botany, Vol. 54, No. 10, p 1079-1083, 1976. 7 fig, 2 tab, 12 ref. OWRT A-027-FLA(9). 14-34-0001-6010.

Descriptors: *Biocontrol, *Florida, Reservoirs, Aquatic plants, *Water hyacinth, *Aquatic weed control.
Identifiers: *Cercospora rodmanii, *Pathogens.

A species of Cercospora was isolated from declining water hyacinths in the Rodman Reservoir in Florida. Differences between this isolate and a previously reported C. piaropi from water hyacinths and other morphologically similar species of Cercospora from other hosts warranted the establishment of a new species, C. rodmanii. Field evaluations of C. rodmanii indicate that it has biological-control potential for water hyacinth. (Morgan-Florida)
W77-02540

MYCOLEPTODISCUS TERRESTRIS LEAF SPOT ON WATERHYACINTH,
Florida Univ., Gainesville. Dept. of Plant Pathology.
R. Charudattan, and K. E. Conway.
Plant Disease Reporter, Vol 60, No 1, p 77-80. January, 1976. 1 fig, 10 ref. OWRT A-027-FLA(8). 14-34-0001-6010.

Descriptors: *Biocontrol, *Water hyacinth, Legumes, Root systems, Aquatic plants, Aquatic fungi.
Identifiers: *Mycoleptodiscus terrestris, *Leaf spots, *Plant pathogens.

Mycoleptodiscus terrestris, a root- and crown-rot organism on several legumes, is reported for the first time to cause a necrotic leaf spot on waterhyacinth (Eichhornia crassipes). In greenhouse tests, a suspension of conidia and mycelia of the organism sprayed on aerial parts caused spots on leaves of waterhyacinth, Capsicum annum, Glycine max, Lotus corniculatus, Lycopersicon esculentum, Melilotus alba, Phaseolus limensis, P. vulgaris, Pisum sativum, Trifolium incarnatum, and T. repens. In contrast, Arachis hypogaea, Cucumis sativus, Medicago sativa, Nicotiana tabacum, Trifolium hybridum, and T. pratense did not develop symptoms. Root discoloration and root rot occurred only on soil-inoculated legumes; crimson and white clovers were most susceptible. When waterhyacinth was floated in a suspension of conidia and mycelia, its roots or other parts were unaffected by the fungus. A mixture of ul-

traviolet and fluorescent lights induced profuse sporulation on potato-dextrose agar (PDA) cultures of M. terrestris. M. terrestris is not a virulent pathogen on waterhyacinth, but it may be a more ubiquitous pathogen than recognized. (Morgan-Florida)
W77-02543

THE EFFECT OF SELENITE ON THE PHYSIOLOGICAL AND MORPHOLOGICAL PROPERTIES OF THE BLUE-GREEN ALGA PHORMIDIUM LURIDUM VAR. OLIVACEA,
Medical Coll. of Ohio at Toledo. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-02546

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE PLYWOOD, HARDBOARD AND WOOD PRESERVING SEGMENT OF THE TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D. C. Effluent Guidelines Div.
R. E. Williams.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-240 811, Price codes: A15 in paper copy, A01 in microfiche. Report EPA-440/1-74-023a, April, 1974. 339 p, 45 fig, 148 ref, 72 tab.

Descriptors: *Waste water treatment, *Water pollution treatment, *Water quality standards, Wastes, Industrial wastes, Water pollution sources, Water pollution, Water pollution control, Water quality control, Waste treatment, Regulation, Effluents, Lumber, Preservation, Water quality.
Identifiers: *Forest products industry, Plywood, Hardboards, Barking, Veneer.

Findings are presented of a study of the plywood, hardboard, and wood preserving segment of the timber products processing industry for the purpose of developing effluent limitation guidelines for existing plants and standards for new plants. The plywood, hardboard, and wood preserving segment of the industry was divided into 8 subcategories based primarily on distinctions generated from differences in the type of product manufactured and the specific processes involved. Best practicable control technology currently available for six of the subcategories was determined to be no discharge of process waste water pollutants into navigable waters. These subcategories include barking, veneer, plywood, hardboard (dry process), wood preserving, and wood preserving (boultonizing). Discharges are allowed for hydraulic barking operations and direct steam conditioning in the veneer manufacturing operations. Quantitative limitations are determined for the hardboard (wet process) and the wood preserving (steam conditioning) subcategories. The new source performance standards for the 6 subcategories is no discharge of pollutants into navigable waters. A discharge is allowed for effluents from hydraulic barking operations. With pretreatment, effluents from these segments of the wood processing industry can be discharged into publically owned waste water treatment plants. (Witt-IPC)
W77-02554

THE USE OF TENAX FOR THE EXTRACTION OF PESTICIDES AND POLYCHLORINATED BIPHENYLS FROM WATER. II. TESTS WITH ARTIFICIALLY POLLUTED AND NATURAL WATERS,
Rome Univ. (Italy).
V. Leoni, G. Puccetti, R. J. Colombo, and A. M. D'Ovidio.
Journal of Chromatography, Vol. 125, No. 2, p 399-407, October 13, 1976. 1 fig, 22 ref, 5 tab.

Descriptors: *Water analysis, *Pollutant identification, *Polychlorinated biphenyls, *Pesticides, *Separation techniques, Trace elements, Water pollution sources, Water chemistry, Filtration, Suspended solids, Wastes, Analytical techniques.
Identifiers: *Tenax.

The application of Tenax to the extraction of organic micropollutants such as pesticides and polychlorobiphenyls from waters has been studied. It was observed that in the presence of other pollutants (oil, surface-active substances, etc.) the results obtained with an absorption column of Tenax-Celite are equivalent to those obtained with the continuous liquid-liquid extraction technique. For natural waters that contain solids in suspension that absorb pesticides, it may be necessary to filter the water before extraction with Tenax and then to extract the suspended solids separately. Analyses of river and estuarine sea waters, filtered before extraction, showed the effectiveness of Tenax, and the extracts obtained for the pesticide analysis proved to be less contaminated by interfering substances than the corresponding extracts obtained by the liquid-liquid technique. (Witt-IPC)
W77-02561

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

UTILITY OF URBAN RUNOFF MODELING, (PROCEEDINGS OF A SPECIAL SESSION, SPRING ANNUAL MEETING, AMERICAN GEOPHYSICAL UNION, WASHINGTON, D.C. 14 APRIL 1976.
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 2A.
W77-02076

MATHEMATICAL MODELS FOR USE IN PLANNING REGIONAL WATER RESOURCES AND ENERGY SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
E. D. Brill, Jr, S. G. Velioglu, and R. W. Fuessle.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 364, Price codes: A05 in paper copy, A01 in microfiche. Illinois Water Resources Center, Urbana, Research Report No. 116, November 1976, 87 p, 9 fig, 54 ref, 10 tab, 2 append. OWRT B-092-Ill(1).

Descriptors: *Energy, Natural resources, *Optimization, *Planning, *Powerplants, *Regional development, *Systems analysis, *Water resources development, *Mathematical models, Water demand, Alternative planning, Water allocation(Policy).
Identifiers: Coal conversion facilities.

Existing and projected energy facilities will, in the near future, place major demands on the country's water resources. These demands compete with many other uses of the resources, including municipal and industrial uses, navigation, irrigation, and water quality maintenance. The possible development of coal conversion facilities presents another potential water demand. Complex public sector problems such as: (1) the extent and development of coal conversion capacity, (2) interbasin transfer of water, (3) cooling technologies for large energy facilities, (4) diversion of Lake Michigan water, and (5) allowable withdrawal and consumptive uses of river water, all arise from the interlocking nature of the water resources-energy system. Although mathematical models cannot solve these problems directly, they can be useful in gaining insight into major issues associated with policy alternatives. With the aid of such models, quantitative trends such as costs and water development patterns associated with each decision alternative can be more readily identified. Mathematical models are presented for use in planning a regional allocation of water for energy facilities as well as for other water uses. These models include components for the interrelated water and energy subsystems. The use of these models in conjunction with other existing models in order to provide a better picture of the overall system is discussed. Since the models use widely available computer codes, they are practical and easy to utilize.
W77-02079

METHODS FOR DETERMINING RECREATIONAL, ENVIRONMENTAL, AND ECONOMIC CONSEQUENCES OF ALTERNATIVE DEVELOPMENT PROGRAMS FOR THE BEAR LAKE AREA,
Utah State Univ., Logan. Dept. of Forestry and Outdoor Recreation.
For primary bibliographic entry see Field 6B.
W77-02082

METARATIONALITY IN BENEFIT-COST ANALYSES,
Louisville Univ., Ky. Systems Science Center.
For primary bibliographic entry see Field 6B.
W77-02123

ON THE INCOME DISTRIBUTIONAL EFFECTS OF ENVIRONMENTAL MANAGEMENT POLICIES,
British Columbia Univ., Vancouver. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W77-02124

OPERATION OF A RESERVOIR COLLECTING WATER FROM A SMALL WATERSHED,
Technion - Israel Inst. of Tech., Haifa. Lowdermilk Faculty of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W77-02126

A BIOECONOMIC SIMULATION ANALYSIS OF REGULATING GROUNDWATER IRRIGATION,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W77-02549

6B. Evaluation Process

PROBLEM IDENTIFICATION AND RANKING, A SELECTED REVIEW OF TECHNIQUES USED BY PUBLIC AGENCIES,
Illinois Univ. at Urbana-Champaign. Dept. of Urban and Regional Planning.
A. Harris, L. F. Blair, W. T. Lamm, H. Felstehausen, and T. A. Austin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 391, Price codes: A06 in paper copy, A01 in microfiche. Water Resources Research Center, University of Minnesota, Regional Research Series Number 1. Sept. 1976, 104 p. OWRT B-057-IA(1).

Descriptors: *Planning, *Mississippi River basin, *Research priorities, Administrative agencies, Federal government, State governments, Governmental interrelations.
Identifiers: Upper Mississippi River basin.

Three aspects of water and related land resource problem identification and ranking procedures are investigated: (1) past approaches to problem identification and ranking in the Upper Mississippi River basin; (2) an overview of present identification/ranking activities in eight selected agencies and governmental levels; and (3) a detailed investigation of identification/ranking procedures as developed within a single federal agency.

W77-02080

METHODS FOR DETERMINING RECREATIONAL, ENVIRONMENTAL, AND ECONOMIC CONSEQUENCES OF ALTERNATIVE DEVELOPMENT PROGRAMS FOR THE BEAR LAKE AREA,
Utah State Univ., Logan. Dept. of Forestry and Outdoor Recreation.
J. F. Hoagland, D. C. Iverson, and L. S. Davis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 433, Price codes: A12 in paper copy, A01 in microfiche. June 1976. 248 p, 7 fig, 37 tab, 50 ref, 8 append. OWRT A-026-UTAH(1). 14-34-0001-6046.

Descriptors: Planning, *Environmental effects, *Recreation, Programs, Utah, Idaho, Methodology, Lakes, Model studies, *Economic impact, *Alternative planning, Decision making, Cost-benefit analysis, *Input-output analysis.
Identifiers: *Bear Lake area(Utah-Idaho).

An attempt is made to provide the natural resource planner and decision maker with a practical methodology for evaluating the quantitative and qualitative aspects of recreation opportunity for alternative land and water resource development plans. Two linked models comprise the methodology used (initiated at Bear Lake which borders Utah and Idaho). The first model estimates the maximum carrying capacity of a water resource system for recreation activities. The output of this model is a listing of the maximum kinds, amounts and quality of recreation activity that can be performed in different seasons and in different sectors of the resource. The second model considers the limitations of access, facilities, budgets and policy in determining the mix of recreation opportunities which can be effectively supplied. This model is formulated as a linear programming problem and provides as output a list of the kinds and amounts of recreation opportunity that can actually be supplied. The approach developed here provides a link between the socio-economic and biological aspects of resource decision making. It is a supply-oriented approach which establishes a resource's physcical recreation carrying capacity and then, in light of various economic, political, social and administrative constraints, provides the planner with a view which may help make a rational decision.
W77-02082

METARATIONALITY IN BENEFIT-COST ANALYSES,
Louisville Univ., Ky. Systems Science Center.
R. K. Ragade, K. W. Hipel, and T. E. Unny.
Water Resources Research, Vol. 12, No. 5, p 1069-1076, October 1976. 8 tab, 10 ref.

Descriptors: *Water resources, *Management, *Methodology, *Cost-benefit analysis, Optimization, River basin development, Fishing, Projects, Decision making, Equations, Mathematical models, Systems analysis.
Identifiers: *Metarationality, Pseudo-Boolean functions, *Metagame analysis.

In water resources management, intangibles and multiple decision criteria exist as a result of various multipurpose needs. This paper presents a type of benefit-cost analysis which is capable of handling both quantitative and intangible benefits and costs. Using this methodology, it is possible for each interest group to assign values to benefits and costs according to what the group thinks is correct. Linguistic descriptions are sufficient for the intangibles. The method is based upon the theory of metarationality, and it is shown how pseudo-Boolean functions can be used to define the concepts of metarationality and also to record preferences of the parties involved in an analysis. In an example, the preferences of two nations involved in a fishing dispute are recorded using the pseudo-Boolean functions. The methodology is applied to a hypothetical river basin problem. (Bell-Cornell)
W77-02123

SWIMMING PARTICIPATION AND WATER QUALITY IN TOMPKINS COUNTY, NEW YORK,
Cornell Univ., Ithaca, N. Y. Dept. of Natural Resources.
For primary bibliographic entry see Field 5G.
W77-02185

PHYSICAL AND ECONOMIC EFFECTS ON THE LOCAL AGRICULTURAL ECONOMY OF WATER TRANSFER TO CITIES,
Economic Research Service, Fort Collins, Colo. Natural Resource Economics Div.
R. L. Anderson, N. I. Wengert, R. D. Heil, D. Williams, and C. Palmer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 359, Price codes: A04 in paper copy, A01 in microfiche. Colorado Environmental Resources Center Fort Collins, Completion Report Series No. 75, October 1976. 48 p, 6 fig, 35 tab, append. OWRT A-027-COLO(1). 14-31-0001-5006.

Descriptors: Input-output analysis, Institutional constraints, Income, *Irrigation, Municipal water, Water rights, Cities, *Colorado, Water supply, Urbanization, *Economic impact, Agriculture, *Water transfer, *Suburban areas, *Condemnation, Legal aspects.
Identifiers: Colorado front range.

Rapid suburban growth north of Denver, Colorado has caused developing communities to expand their municipal water systems. In order to obtain additional water supplies, the cities of Thornton and Westminster have initiated condemnation suits against three irrigation companies to obtain their water rights. The three irrigation companies have a service area of about 40,000 acres--30,000 are currently irrigated. Of this land, 80 percent is class II and III, the highest classes found in Colorado. Approximately 400 farms and small tracts receive water from these companies--200 are commercial farms. Total agricultural production from the irrigated lands is about $8 million per year. Economic input-output analysis shows that irrigated agriculture contributes 561 jobs to the economy and over $4 million in net income. The cities and irrigation companies should work together to develop joint use of water rather than drying up irrigated lands for municipal water supply.
W77-02190

PROCEEDINGS: 8TH ANNUAL WATER RESOURCES SEMINAR GROUNDWATER RESOURCES AND DEVELOPMENT NOVEMBER 24 AND 25, 1975.
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 4B.
W77-02223

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: CANE SUGAR REFINING,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5D.
W77-02414

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE FABRICATED AND RECLAIMED RUBBER SEGMENT OF THE RUBBER PROCESSING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D. C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5D.
W77-02415

ECONOMIC EFFECTS OF ENFORCEMENT VARIABLES ON COMMERCIAL OIL POLLUTION CONTROL STRATEGY,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 5G.
W77-02418

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE FORMULATED FERTILIZER SEGMENT OF THE FERTILIZER MANUFACTURING, POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5D.
W77-02419

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE PRIMARY ALUMINUM SMELTING SUBCATEGORY OF THE ALUMINUM SEGMENT OF THE NONFERROUS METALS MANUFACTURING, POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D. C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5D.
W77-02421

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: THE TEXTILES, FRICTION AND SEALING MATERIALS SEGMENT OF THE ASBESTOS MANUFACTURING INDUSTRY,
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W77-02422

ECONOMIC AND ENVIRONMENTAL IMPACTS OF AGRICULTURAL LAND DRAINAGE IN ONTARIO,
York Univ., Downsview (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 4A.
W77-02425

ENERGY FROM COAL.
Tetra Tech, Inc., Arlington, Va.
For primary bibliographic entry see Field 6D.
W77-02430

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES FOR SEAFOOD PROCESSING INDUSTRY: (FISH MEAL, SALMON, BOTTOM FISH, CLAMS, OYSTERS, SARDINES, SCALLOPS, HERRING, ABALONE),
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5D.
W77-02433

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: BEET SUGAR INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5D.
W77-02434

PRINCIPLES OF DETERMINING A SOCIAL DISCOUNT RATE,
Rutgers - The State Univ., New Brunswick, N. J. Water Resources Research Inst.
W. Whipple, Jr.
Water Resources Bulletin, Vol 11, No 4, p 811-819, August 1975. 2 fig, 20 ref. OWRT A-048-NJ(1).

Descriptors: Cost-benefit analysis, *Interest, *Discount rate, Economics, Risks, Taxes, Infla-

tion(Economic), Government supports, Cost analysis, US Water Resources Council.
Identifiers: *Opportunity cost theory.

An analysis is made of theories of determining government interest and discount rates. It is found that generally favored opportunity cost theories must now be reconsidered in the light of the chronic currency depreciation of the present era, and à less optimistic viewpoint as to the future. On account of our tax structure, the reconciliation between alternative theories depends upon the social evaluation of the corporate income tax. If this tax is construed as being socially desirable, it seems that our current discount rates should be reduced to perhaps 5%, as long as future benefits are to be evaluated in terms of present day prices.
W77-02518

OLD ANSWERS TO 'NEW' PROBLEMS: HENRY GEORGE, PROPERTY RIGHTS AND ENVIRONMENTAL QUALITY,
Clemson Univ., S.C.
B. Yandle, and A. H. Barnett.
Journal of Economics and Sociology, Vol. 33, No. 4, p 393-400, October 1974. S-038-SC.

Descriptors: *Economics, *Resource allocation, *Management, Economic rent, Decision making, Public rights, Equity, Income distribution, Economic efficiency, *Water quality.
Identifiers: *Property rights, Externalities.

Some of the implicit assumptions in several of the major economic proposals for water quality management are considered. These are compared to the assumption made by Henry George in his analysis of property rights in land. The Georgian management scheme is then analyzed in light of current proposals and George's contributions are evaluated.
W77-02539

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

PROSPECTS FOR AN AGRO-INDUSTRIAL COMPLEX ON THE GAZA-SINAI SEA COAST,
State Univ. of New York at Buffalo.
For primary bibliographic entry see Field 3A.
W77-02115

MINIMIZING COSTS IN WELL FIELD DESIGN IN RELATION TO AQUIFER MODELS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 8B.
W77-02161

THE ECONOMICS OF PRESSURIZED IRRIGATION SYSTEMS FOR MATURE CITRUS ORCHARDS IN SOUTHWESTERN ARIZONA,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W77-02165

RATIONAL WATER PRICING IN THE TUCSON BASIN,
Arizona Univ., Tucson. Coll. of Business and Public Administration.
For primary bibliographic entry see Field 6D.
W77-02170

PRICING URBAN WATER,
Arizona Univ., Tucson. Coll. of Business and Public Administration.
For primary bibliographic entry see Field 6D.
W77-02171

A COMPREHENSIVE SYSTEMS ENGINEERING STUDY OF THE TRUE ECONOMIC VALUE OF UNPOLLUTED WATER VERSUS VARYING DEGREES OF POLLUTED WATER,
Rhode Island Univ., Kingston. Dept. of Mechanical Engineering and Applied Mechanics.
For primary bibliographic entry see Field 5G.
W77-02220

ECONOMIC IMPACTS OF WEATHER VARIABILITY,
Missouri Univ., Columbia. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 3B.
W77-02429

ENVIRONMENTAL TRUST FUNDS: AN EVALUATION,
RIVUS, Inc., Glen Burnie, Md.
For primary bibliographic entry see Field 5G.
W77-02432

6D. Water Demand

MATHEMATICAL MODELS FOR USE IN PLANNING REGIONAL WATER RESOURCES AND ENERGY SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W77-02079

THE ARIZONA WATER PLAN: A STATUS REPORT,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 4D.
W77-02104

WATER USE IMPLICATIONS FOR NUCLEAR POWER STATIONS IN THE UNITED STATES OF AMERICA,
Columbia Univ., New York.
For primary bibliographic entry see Field 6G.
W77-02114

WATER REQUIREMENTS FOR SOLAR ENERGY,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 3E.
W77-02122

THE COPPER INDUSTRY AND WATER IN ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 3E.
W77-02166

RATIONAL WATER PRICING IN THE TUCSON BASIN,
Arizona Univ., Tucson. Coll. of Business and Public Administration.
J. L. Barr, and D. E. Pingry.
Arizona Review, Vol. 25, No. 10, p 1-11, October, 1976. 2 fig, 4 tab, 7 ref.

Descriptors: *Water rates, *Competing uses, *Water management(Applied), *Water costs, *Water consumption, *Water demand, Water supply, Water shortage, Water utilization, Water policy, Water allocation(Policy), *Arizona, Irrigation, Social impact, Industrial water, Water table, Water sources, Recharge.
Identifiers: *Tucson basin(Ariz).

Man-made water demands for urban use, crop cultivation and industrial activitity can disrupt the rainfall runoff supply of water, causing shortages. If the supply of water is not completely renewable, today's consumption impinges on the amount available in the future. A low price encourages consumption. This article discusses rational water pricing and the problem of allocating water efficiently in the Tucson Basin. Any solution to the problem will require better public understanding and some type of water conservation. The city of Tucson, agriculture, and copper mines all share the water available in the Basin, so that control of all three user types is required. It is concluded that it is cheaper to conserve water than report it from other areas, that water is seriously underpriced in Tucson, and there should be an increase in water rates. Scarcity pricing will discourage urban growth, industrial use and crop cultivation, but crop cultivation will be affected most severely. (Jamail-Arizona)
W77-02170

PRICING URBAN WATER,
Arizona Univ., Tucson. Coll. of Business and Public Administration.
J. T. Wenders.
Arizona Review, Vol. 25, No. 10, p 13-21, October, 1976. 1 fig, 12 ref.

Descriptors: *Water demand, *Water rates, *Water supply, *Water policy, *Water costs, Competing uses, Water allocation(Policy), Water zoning, Water shortage, Water users, Water resources development, Water management(Applied), Water consumption, *Arizona.
Identifiers: *Tucson(Ariz).

Water demand, rates, cost allocation and overall water policy in Tucson are evaluated. The term water 'needs' implies that there are no trade-offs between water and other resources. It is contended that if water were delivered at a higher price, then people would be more concerned with conservation. The optimal level of water usage and peak and off-peak incremental costs are discussed. The authors argue against political rate making and in favor of peak load pricing that would charge higher rates for water used during the peak times of the year and of the day. It is concluded that (1) a scarcity price must be set on water and charged in addition to delivery costs; (2) seasonal, lifting, and distance price differentials based upon incremental costs must be established, and (3) the public has become accustomed to water rates which have been too low. (Jamail-Arizona)
W77-02171

HYDROLOGY OF LAKE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-02316

WATER RESOURCES INFORMATION NEEDS FOR THE SUWANNEE RIVER WATER MANAGEMENT DISTRICT,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-02318

ENERGY FROM COAL.
Tetra Tech. Inc., Arlington, Va.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $2.05. Report No. ERDA 76-67, 1976. 124 p, 39 fig, 3 tab, 159 ref. E(49-18)-2225.

Descriptors: *Energy, *Coals, Bibliographies, Economics, Social aspects, Legislation, Coal mines, Coal mine wastes, Land reclamation, Mining, Transportation, Reviews.
Identifiers: Coal gasification, Coal liquefaction, Coal preparation.

An overview of coal as an energy source is presented. Major aspects considered were: coal

supply and demand, classification of coal, mining technology including land reclamation, coal transportation and storage, coal preparation, coal process technology, economic considerations, and legislative policy. Short bibliographies follow discussion of each aspect. While the United States has more energy available in the form of coal than in the combined resources of petroleum, natural gas, oil shale, and tar sands, this solid fuel can currently be applied to only a limited portion of the total national energy demand; primarily that of the electric utilities. Consequently, converting coal to gaseous and liquid fuels in commercial quantities is necessary in order to make it available to energy users in the transportation, household, and commercial sectors. Coal gasification and liquefaction processes are emphasized in the report. Progress in resolving technical and social problems related to the use of coal, such as land reclamation of mined land and health hazards, is described. Lack of sufficient capital and the related concerns of manpower, equipment, and transportation is a serious constraint on expansion of the industry's market. (Luedtke-Wisconsin)
W77-02430

6E. Water Law and Institutions

PROBLEM IDENTIFICATION AND RANKING, A SELECTED REVIEW OF TECHNIQUES USED BY PUBLIC AGENCIES,
Illinois Univ. at Urbana-Champaign. Dept. of Urban and Regional Planning.
For primary bibliographic entry see Field 6B.
W77-02080

LAW, HYDROLOGY, AND SURFACE-WATER SUPPLY IN THE UPPER COLORADO RIVER BASIN,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
G. C. Jacoby, Jr., G. D. Weatherford, and J. W. Wegner.
Water Resources Bulletin, Vol. 12, No. 5 p 973-984, October, 1976. 4 fig, 24 ref.

Descriptors: *Colorado River Basin, *Water resources development, *Colorado River Compact, *Water law, Legal aspects, Hydrology, Water supply, Surface waters, River basin development, Water resources, Water Allocation(Policy), Water demand, Streamflow, Water policy, Groundwater, Boulder Canyon Project Act, Colorado River, Dendrochronology.
Identifiers: Central Arizona Project.

The relationship between law and hydrology in water resources development is discussed. Law attempts to allocate a limited and valuable resource while hydrology tries to define the limits of the resource. In the past an inadequate data base has made hydrologic estimates difficult and political factors pushed the law into possibly conflicting commitments in the Colorado River Basin. The water allocation process and the role of hydrology in defining the risk of deficiency are described and a historical overview of the interaction between law and hydrology is presented. Using tree-ring research, hydrologists have produced a more definite data base and thus given legal policy makers more reliable information. As development approaches the resource limit in the Upper Colorado River Basin, lawyers and hydrologists must act in concert toward the equitable solution of allocation and reallocation problems. (Jamail-Arizona)
W77-02119

EXPERTS CLING TO WATER MYTHS,
For primary bibliographic entry see Field 3F.
W77-02120

PHYSICAL AND ECONOMIC EFFECTS ON THE LOCAL AGRICULTURAL ECONOMY OF WATER TRANSFER TO CITIES,
Economic Research Service, Fort Collins, Colo. Natural Resource Economics Div.
For primary bibliographic entry see Field 6B.
W77-02190

INTERNATIONAL SEABED REGIME: INDIA'S INTERESTS AND POLICY OPTIONS,
Lucknow Univ. (India).
M. Shyam, and S. Sunder.
Indian Political Science Review, Vol. 10, No. 1, p. 1-18, 1976.

Descriptors: *Law of the sea, *Oceans, *Mining, *India, Copper, Nickel, Regulation, Cobalt, Manganese, International waters, International law, Governments, Jurisdiction, Economic impact.
Identifiers: *Seabed mining, *Manganese nodules.

India's alternatives with respect to the development of a regime to govern the exploitation of the seabed resources beyond national jurisdictions are discussed, taking into account potential future discoveries and technological breakthroughs as well as known resources. Manganese nodules, containing copper, nickel, cobalt, and possible manganese, are the most promising known resources of the seabed. India's manganese exports are likely to be hurt by seabed production but India may benefit from lower prices of copper, nickel, and cobalt. Besides these direct economic effects, India's policy toward a new seabed regime should consider such factors as preventing of a new form of colonial competition over the seabed, Indian access to seabed technology and research results, securement of her fair share of the wealth of the seas, and prevention of ecological damage to the oceans. Examination of three major policy options indicates that a strong international agency with regulatory authority would best suit India's interests, as opposed to a continuation of the status quo (no international agency) or establishment of a weak agency restricted to registry functions. (Luedtke-Wisconsin)
W77-02424

ATLANTIC OFFSHORE OIL: THE NEED FOR PLANNING AND REGULATION,
Woods Hole Oceanographic Institution, Mass. Marine Policy and Ocean Management Program.
For primary bibliographic entry see Field 6G.
W77-02426

THE FLOOD DISASTER PROTECTION ACT OF 1973,
Pennsylvania State Univ., University Park. Dept. of Business Law.
For primary bibliographic entry see Field 6F.
W77-02427

MINNESOTA WATER RESOURCES BOARD AND WATERSHED DISTRICTS.
Minnesota Water Resources Board, St. Paul.
Legislative Report 1974. 48 p. 2 fig, 6 append.

Descriptors: *Minnesota, *Watershed management, *State governments, *Legislation, Judicial decisions, Local governments, Water management(Applied), Costs, Water resources development.
Identifiers: *Watershed districts, Minnesota Watershed Act, Minnesota Water Resources Board.

The course of Minnesota water resources management activities under the auspices of that state's Water Resources Board and the Watershed Act is summarized. Minnesota Statutes, Sections 105.71-105.79 and 112.34-112.86 (1955, 1975) called for the establishment of individual watersheds with authority vested in local units, and created the Water Resources Board to perform as a quasi-judicial body for the establishment and general supervision of the watershed districts as well as resolving water policy questions between state departments or individuals and a state department. By 1973, 34 watershed districts were established, and the constitutionality of the Act as well as Board decisions have been affirmed in court. A tabulation of these judicial decisions is appended. Brief summaries of each of the 34 water district's problems and projects are included, along with a cost breakdown of individual projects or improvements. Overall, a grand total of $64,676,974 has been expended, over 80% of which has come from federal sources. It is concluded that this system is accomplishing its legislative intent, but that the procedure for resolving conflicts is underutilized because agencies and individuals seem unaware of the opportunities provided by the legislation. (Luedtke-Wisconsin)
W77-02428

GROUNDWATER AND GROUNDWATER LAW IN MASSACHUSETTS.
Massachusetts Commonwealth Div. of Water Resources, Boston.
For primary bibliographic entry see Field 4B.
W77-02437

PRINCIPLES OF DETERMINING A SOCIAL DISCOUNT RATE,
Rutgers - The State Univ., New Brunswick, N. J. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W77-02518

6F. Nonstructural Alternatives

THE FLOOD DISASTER PROTECTION ACT OF 1973,
Pennsylvania State Univ., University Park. Dept. of Business Law.
B. L. Myers.
American Business Law Journal, Vol 13, p 315-333, 1976. 17 ref.

Descriptors: *Flood plain insurance, *Flood plain zoning, Non-structural alternatives, Flood protection, Floodproofing, Land use, Building codes, Design standards, Regulation, Federal government, Local governments, Legislation, Insurance, Costs, Compensation.
Identifiers: *Flood Disaster Protection Act of 1973.

The background, requirements and implications of the Flood Disaster Protection Act of 1973, the latest amendment to the National Flood Insurance Act of 1968, are discussed. Basically the 1973 amendment is an attempt to overcome the problems posed in the 1968 Act by: (1) substantially increasing the limits of flood insurance coverage available to property owners, (2) rapidly identifying all flood-prone communities and requiring them to participate in the flood insurance program, and (3) requiring virtually all new construction and new property owners in flood zones to be covered by flood insurance. It requires flood insurance as a prerequisite to obtaining federal mortgage money or mortgage money from a federally insured or related lending institution. As such, it will likely establish a new vista in federal land use control, by bringing nearly seven per cent of the land in the United States under federal regulations. If a community refuses to participate in the HUD administered program, virtually all sources of funds for flood plain development would be eliminated, present owners will be unable to purchase insurance, but the federal government will continue to provide disaster relief. If a community participates, all structures in the flood plain would be elevated above the 100-year flood level or floodproofed to that level. (Luedtke-Wisconsin)
W77-02427

6G. Ecologic Impact Of Water Development

EVALUATION OF ESTUARINE SITE DEVELOPMENT LAGOONS,
Cook Coll., New Brunswick, N.J.
For primary bibliographic entry see Field 5G.
W77-02088

WATER USE IMPLICATIONS FOR NUCLEAR POWER STATIONS IN THE UNITED STATES OF AMERICA,
Columbia Univ., New York.
G. J. Halasi-Kun.
Nordic Hydrology, Vol. 6, No. 1, p 1-13, 1975. 6 fig, 1 tab, 12 ref.

Descriptors: *Nuclear powerplants, *Water requirements, *Water consumption(Except consumptive use), *Water demand, *Thermal pollution, Nuclear energy, Water utilization, Nuclear reactors, Water cooling, Environmental effects, Water pollution, Heated water, Water pollution sources, Water temperature, Water supply, Available water, Cooling towers, United States.

The location of nuclear powerplants must be considered in relation to their total environment. The problems in selecting reactor sites are discussed in terms of population density, coolant water demand, thermal pollution, and engineered safeguard measures during construction and operation. The coolant water demand is a major problem in selecting a reactor site. The critical period for water consumption is the late, hot summer. This generally coincides with the lowest surface flow and the highest period of fresh water demand. Because of the possibility of water shortages in some areas of the United States, especially in arid areas, increasing consideration is being given to the use of dry cooling towers for waste rejection and to improving efficiency of existing and planned reactors. (Jamail-Arizona)
W77-02114

ON THE INCOME DISTRIBUTIONAL EFFECTS OF ENVIRONMENTAL MANAGEMENT POLICIES,
British Columbia Univ., Vancouver. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W77-02124

ECOLOGICAL IMPACTS OF SNOWPACK AUGMENTATION IN THE SAN JUAN MOUNTAINS OF COLORADO.
Colorado State Univ., Fort Collins. Coll. of Forestry and Natural Resources.
For primary bibliographic entry see Field 3B.
W77-02160

A COMPUTERIZED INFORMATION SYSTEM ON THE IMPACTS OF COAL-FIRED ENERGY DEVELOPMENT IN THE SOUTHWEST,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
D. W. Layton.
Ph.D. Dissertation, 1975. 108 p, 3 fig, 15 tab, 4 append.

Descriptors: *Computer programs, *Data processing, *Electric power production, *Southwest US, Environmental effects, Data storage and retrieval, Systems analysis, Computers.

Research was conducted on the development and evaluation of a computerized information system designed to selectively transfer data on the individual and cumulative impacts of several electric generating facilities in the southwestern United States. Primary impacts considered by the Four Corners Program, of which this system was a part, include those on surface water and groundwater. This system incorporates elements of management and environmental information systems and an issue-oriented system developed at the University of Illinois, thus providing the capacity for communicating impact information derived from various sources. The system can retrieve textual material stored in a base information file or execute on-line simulation models and routines in order to describe environmental impacts. The acquisition and communication of environmental impact information is discussed, and the hybrid system's design and development outlined. Evaluation was conducted by demonstrating the system to prospective users from electrical utilities, government agencies and members of the public in Arizona. Results indicate that this technology is a viable means of transmitting environmental information and that its usefulness is likely to depend more on credibility than convenience. (Jahns-Arizona)
W77-02163

ENERGY DEVELOPMENT: THE ENVIRONMENTAL TRADEOFFS. VOL. 2: RELATIVE ENVIRONMENTAL ASSESSMENT OF METHODS TO INCREASE ENERGY PRODUCTION, CRUDE OIL, PIPELINE QUALITY GAS, AND ELECTRICITY FROM WESTERN COAL,
Stanford Research Inst., Menlo Park, Calif.
M. D. Levine, and R. V. Steele.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 001, Price codes: A07 in paper copy, A01 in microfiche. Report October 1975. 125 p. 3 fig, 28 tab, 55 ref. 68-01-2469.

Descriptors: *Alternative planning, *Decision making, *Energy conversion, *Evaluation, *Environmental effects, Air pollution, Natural gas, Water quality, Oil fields, Land use, Social impact, Public health, Aesthetics, Water consumption, Electric power production, Coals, Oil shales, Fossil fuels.
Identifiers: *Energy production, *Environmental tradeoffs, *Environmental impacts, Coal liquefaction, Coal gasification.

The relative environmental tradeoffs among each of three sets of options for increasing energy production are analyzed. Environmental indicators used in the analysis include sulfur dioxide, nitrogen oxides, and particulate impacts on air quality, public health, aesthetics, land use, water consumption relative to availability, and water quality. Results indicate that options for development and use of Western coal for electricity generation reflect the following: (1) low-Btu gasification/combined-cycle electricity generation is less environmentally damaging than steam electricity generation, (2) the critical tradeoffs between steam generation in the West and in the Midwest are the adverse social impacts, high water consumption and potential degradation of clean air in the West versus high levels of air pollution near populated areas in the Midwest, and (3) low-Btu gasification/combined-cycle electricity generation in the Midwest has significantly lower social and water consumption impacts than the same technology in the West. Tradeoffs among seven measures for increasing domestic oil production, and among four options for increasing pipeline quality gas supplies were also analyzed. It was concluded that the use of miscellar flood techniques of assisted recovery pose the least adverse environmental risks and oil shale development the greatest risks among the choices for crude oil supplies, and gasification of midwestern coal and production of gas from Atlantic and southern Caifornia OCS were the most favorable options for gas supplies. (See also W76-13039) (Luedtke-Wisconsin)
W77-02423

ECONOMIC AND ENVIRONMENTAL IMPACTS OF AGRICULTURAL LAND DRAINAGE IN ONTARIO,
York Univ., Downsview (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 4A.
W77-02425

ATLANTIC OFFSHORE OIL: THE NEED FOR PLANNING AND REGULATION,
Woods Hole Oceanographic Institution, Mass. Marine Policy and Ocean Management Program.
J. M. Friedman.
Oceanus, Vol 19, No 1, p 22-37, 1975. 3 fig.

Descriptors: *Planning, *Regulation, *New England, *Oil fields, *Continental Shelf, Regional development, Social impact, Economic impact, Federal jurisdiction, State jurisdiction, Leases, Oil industry, Offshore platforms, Oil spills, Coasts, Atlantic Ocean.
Identifiers: *Onshore impact, *Offshore oil fields, Outer Continental Shelf Land Act, Coastal Zone Management Act, Georges Bank.

The legal-administrative structure for offshore oil development particularly as it affects the New England states through development of the Georges Bank area is discussed. The basic framework for offshore oil development was established by the 1953 Outer Continental Shelf Land Act which gave administrative authority to the Secretary of the Interior who in turn delegated this authority to the Bureau of Land Management (BLM) for leasing of offshore tracts, and to the U.S. Geological Survey (USGS) for regulation of offshore operations. Federal authority for offshore authorization and regulation was sustained by the 1975 case of the United States vs. Maine. During this same period, however, growing public awareness of the environmental costs of unplanned development has led to the enactment of a number of antipollution laws. The most significant for the administrative-legal framework of offshore oil development is the Coastal Zone Management Act which provides a mechanism for coordinating federal and state programs and recognizes that the protection of coastal resources is best achieved through strong local and state participation. To date, BLM and USGS reliance on oil company opinion and expertise has led to poor federal-state relations and hampered effective socio-economic and environmental planning, which is necessary to regulate both pollution and onshore impacts of offshore oil development. Parallels between North Sea development by Scotland and Norway and the New England situation are also suggested. (Luedtke-Wisconsin)
W77-02426

ENVIRONMENTAL TRUST FUNDS: AN EVALUATION,
RIVUS, Inc., Glen Burnie, Md.
For primary bibliographic entry see Field 5G.
W77-02432

STRIP-MINING TECHNIQUES TO MINIMIZE ENVIRONMENTAL DAMAGE IN THE UPPER MISSOURI RIVER BASIN STATES,
Bureau of Mines, Denver, Colo. Intermountain Field Operation Center.
For primary bibliographic entry see Field 5G.
W77-02445

NATIONAL ENVIRONMENTAL STATISTICAL REPORT,
Mitre Corp., McLean, Va.
For primary bibliographic entry see Field 7C.
W77-02447

ANALYSIS OF POLLUTION FROM MARINE ENGINES AND EFFECTS ON THE ENVIRONMENT. SUMMARY REPORT.
Boating Industry Associations, Chicago, Ill.

For primary bibliographic entry see Field 5C.
W77-02449

ARE THE CHESAPEAKE BAY WATERS WARMING UP,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 2L.
W77-02472

OLD ANSWERS TO 'NEW' PROBLEMS: HENRY GEORGE, PROPERTY RIGHTS AND ENVIRONMENTAL QUALITY,
Clemson Univ., S.C.
For primary bibliographic entry see Field 6B.
W77-02539

SURVEY OF MACROINVERTEBRATE COMMUNITIES IN THE PROVO RIVER AND DIAMOND FORK SYSTEMS,
Brigham Young Univ., Provo, Utah. Center for Health and Environmental Studies.
For primary bibliographic entry see Field 5C.
W77-02548

ENVIRONMENTAL ASPECTS OF CHEMICAL USE IN PRINTING OPERATIONS, (SEPTEMBER 22-24, 1975, KING OF PRUSSIA, PA.), CONFERENCE PROCEEDINGS.
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
For primary bibliographic entry see Field 5C.
W77-02553

7. RESOURCES DATA

7A. Network Design

EVALUATION OF THE FEASIBILITY OF USING THE DATA COLLECTION SYSTEM TO OPERATE A NETWORK OF HYDROLOGICAL AND CLIMATO-LOGICAL STATIONS AT SITES REMOTE FROM NORMAL COMMUNICATION LINKS,
Department of Natural Resources, Quebec.
For primary bibliographic entry see Field 7B.
W77-02501

7B. Data Acquisition

GEOPHYSICAL STUDY OF THE WATERBEARING STRATA IN BITTERROOT VALLEY, MONTANA,
Montana Univ., Missoula. Dept of Geology.
For primary bibliographic entry see Field 2F.
W77-02085

MEASUREMENTS OF THE TURBULENT BOUNDARY LAYER UNDER PACK ICE,
Washington Univ., Seattle. Dept of Geophysics.
For primary bibliographic entry see Field 2C.
W77-02138

GULF STREAM KINEMATICS INFERRED FROM A SATELLITE-TRACKED DRIFTER,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-02140

THE USE OF LANDSAT DCS AND IMAGERY IN RESERVOIR MANAGEMENT AND OPERATION,
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W77-02151

PROGRAM REPORT-FY 1975, ATMOSPHERIC AND GEOPHYSICAL SCIENCES DIVISION, PHYSICS DEPARTMENT.
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 2B.
W77-02157

APPLICATIONS OF ERTS PRODUCTS IN RANGE AND WATER MANAGEMENT PROBLEMS, SAHELIAN ZONE: MALI, UPPER VOLTA AND NIGER,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4A.
W77-02167

OPTICAL REMOTE SENSING OF WATER POLLUTANTS,
Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
For primary bibliographic entry see Field 5A.
W77-02192

A NEW TECHNIQUE FOR REMOTE MONITORING OF ACTIVITY OF FRESHWATER INVERTEBRATES WITH SPECIAL REFERENCE OXYGEN CONSUMPTION BY NIAIDS OF ANAX SP. AND SOMATOCHLORA SP. (ODONATA),
Environmental Protection Agency, Grosse Ile, Mich.
For primary bibliographic entry see Field 5C.
W77-02216

A SIMPLE APPARATUS FOR METERING VOLATILE LIQUIDS INTO WATER,
National Marine Fisheries Service, Tiburon, Calif. Tiburon Fisheries Lab.
P. E. Benville, Jr., and S. Korn.
J Fish Res Board Can. 31(3), p 367-368, 1974.

Descriptors: *Measurement, *Volatility, *Gases, Equipment, Instrumentation, Organic compounds, Aromatic compounds.
Identifiers: *Benzene, *Toluene, *Xylene, *Methylbenzene.

A metering device was developed to introduce benzene, toluene, xylene, and 1,2,4, trimethylbenzene vapors into water using air as a carrier gas. Setting the carrier gas flows for the respective aromatics at 10, 25, 120, and 500 cm3/min for 2 h resulted in concentrations of 8.2, 13.0, 12.0, and 7.2 micro-1/1, respectively, in 4 1 of water. The aromatic concentrations were maintained in a static system by bubbling air through the water, and in a continuous flow system by replenishing the water. In static systems the respective aromatic concentrations were maintained for 4 days within the ranges of 13-14, 5.1-7.0, 0.40-0.50, and 0.018-0.028 micro-1/1 by bubbling the aromatics into the water at 5 cm3/min and independently aerating the water at 100 cm3/min. In a 14-day continuous flow system benzene concentrations ranged from 2.1-2.8 micro-1/1 when benzene was bubbling at 23 cm3/min and water was flowing at 1.8 1/min.--Copyright 1974, Biological Abstracts, Inc.
W77-02454

MEASUREMENTS OF ACOUSTIC PROPERTIES OF HARD-PACK SNOW,
Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 2C.
W77-02462

AUTOMATED SEISMIC MONITORING SYSTEM FOR LAKE MICHIGAN ICE STUDIES,
Wisconsin Univ., Milwaukee. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2C.
W77-02468

SPECTRAL CHARACTERISTICS OF THE MICROWAVE EMISSION FROM A WIND-DRIVEN FOAM-COVERED SEA,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 2L.
W77-02476

REMOTE SENSING OF SOIL MOISTURE BY A 21-CM PASSIVE RADIOMETER,
Kansas Univ. Lawrence.
For primary bibliographic entry see Field 2G.
W77-02480

A TECHNIQUE FOR ESTIMATING TROPICAL OPEN-OCEAN RAINFALL FROM SATELLITE OBSERVATIONS,
Hawaii Univ., Honolulu. Dept. of Meteorology.
For primary bibliographic entry see Field 2B.
W77-02484

THE HAILPAD CALIBRATION FOR ITALIAN HAIL DAMAGE DOCUMENTATION,
Ufficio Centrale di Ecologia Agragia e difesa delle Piante coltivate dalle Avversita Meteoriche, Rome (Italy).
For primary bibliographic entry see Field 2B.
W77-02486

MONITORING WATER QUALITY FROM LANDSAT.
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 5A.
W77-02494

SATELLITE MICROWAVE OBSERVATIONS OF SOIL MOISTURE VARIATIONS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 2G.
W77-02495

AN OPERATIONAL APPLICATION OF SATELLITE SNOW COVER OBSERVATIONS - NORTHWEST UNITED STATES,
Bonneville Power Administration, Portland, Oreg.
For primary bibliographic entry see Field 2C.
W77-02496

REMOTE SENSING OF EFFECTS OF LAND-USE PRACTICES ON WATER QUALITY,
Kentucky Univ., Lexington. Dept. of Forestry.
For primary bibliographic entry see Field 5A.
W77-02497

MULTIDISCIPLINARY APPLICATION OF LANDSAT-2 DATA TO MARINE ENVIRONMENT IN CENTRAL JAPAN,
Toba Merchant Marine Coll. (Japan).
For primary bibliographic entry see Field 2L.
W77-02498

SKYLAB IMAGERY: APPLICATION TO RESERVOIR MANAGEMENT IN NEW ENGLAND,
Cold Regions Research and Engineering Lab., Hanover, N.H. Research Div.
For primary bibliographic entry see Field 4A.
W77-02499

USE OF THE LANDSAT-2 DATA COLLECTION SYSTEM IN THE COLORADO RIVER BASIN WEATHER MODIFICATION PROGRAM,
Bureau of Reclamation, Denver, Colo. Div. of Atmospheric Water Resources Management.
For primary bibliographic entry see Field 2B.
W77-02500

EVALUATION OF THE FEASIBILITY OF USING THE DATA COLLECTION SYSTEM TO OPERATE A NETWORK OF HYDROLOGICAL AND CLIMATO-LOGICAL STATIONS AT SITES REMOTE FROM NORMAL COMMUNICATION LINKS,
Department of Natural Resources, Quebec.
R. Perrier.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-16516, Price codes: A02 in paper copy, A01 in microfiche. Report NASA-CR-145996, May 1974. 15 p, 5 fig, 1 tab. NASA SR No. 9663.

Descriptors: *Equipment, *Instrumentation, *Data collections, *Remote sensing, Satellites(Artificial), Temperature, Water levels, Data processing, Gaging stations, Costs, Networks, Economics.
Identifiers: *LANDSAT, *ERTS, Data collection platforms.

A base station constituted of a Data Collection Platform (DCP) and four sensors was evaluated on the following aspects: (1) the adequacy of the sensors used in conjunction with the platform to measure four hydrometeorological variables was examined; (2) the continuity and availability of the measurements obtained during the period were considered; (3) the data obtained were used in conjunction with climato-logical data obtained at other nearby conventional stations and hydrometrical data compared with those recorded at the same stations. (Sims-ISWS)
W77-02501

USE OF LANDSAT DATA FOR NATURAL RESOURCES INVESTIGATION IN THE LOWER BASIN OF DANUBE AND DANUBE DELTA,
Institutul de Constructii din Bucuresti (Rumania). Lab. for Remote Sensing.
For primary bibliographic entry see Field 2L.
W77-02503

SKYLAB STUDY OF WATER QUALITY,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 5A.
W77-02505

RETRANSMISSION OF HYDROMETRIC DATA IN CANADA,
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.
For primary bibliographic entry see Field 7C.
W77-02506

USE OF RADAR INFORMATION IN DETERMINING FLASH FLOOD POTENTIAL,
National Weather Service, Garden City, N. Y. Eastern Region.
For primary bibliographic entry see Field 2B.
W77-02509

OZONE REMOVAL FROM ARC LAMP COOLING AIR,
Auburn Univ., Ala. Charles Richard Saunders Chemical Lab.
W. C. Neely, A. D. West, and T. D. Hall.
Journal of Physics, Section E: Scientific Instruments, 1975, Vol 8, p. 543, 6 ref. OWRT A-035-ALA(7).

Descriptors: *Ozone, Air pollution, Air pollution effects.
Identifiers: Cooling air stream, *Catalytic converters, Arc lamp.

An inexpensive, compact and efficient catalytic converter for removal of ozone from the cooling air stream of compact arc lamps is described. The device uses no power and requires no regeneration. Test results are presented showing essentially complete removal of ozone from the cooling air stream of a typical 150 W xenon arc lamp.
W77-02511

7C. Evaluation, Processing and Publication

AQUEOUS HALOGEN EQUILIBRIA, CASE I. HALOGEN IN PURE WATER,
Army Medical Bioengineering Research and Development Lab., Fort Detrick, Md.
For primary bibliographic entry see Field 5D.
W77-02150

A COMPUTERIZED INFORMATION SYSTEM ON THE IMPACTS OF COAL-FIRED ENERGY DEVELOPMENT IN THE SOUTHWEST,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6G.
W77-02163

APPLICATIONS OF ERTS PRODUCTS IN RANGE AND WATER MANAGEMENT PROBLEMS, SAHELIAN ZONE: MALI, UPPER VOLTA AND NIGER,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4A.
W77-02167

COMPILATION OF STATE DATA FOR EIGHT SELECTED TOXIC SUBSTANCES, VOL. 1, FINAL REPORT,
Mitre Corp., McLean, Va.
For primary bibliographic entry see Field 5G.
W77-02204

COMPILATION OF STATE DATA FOR EIGHT SELECTED TOXIC SUBSTANCES, VOL. IV, COMPILATIONS OF SUMMARIES AND ANALYSES OF STATE DATA,
Mitre Corporation, McLean, Va.
For primary bibliographic entry see Field 5G.
W77-02205

PROJECT DEVELOPMENT AND DATA PROGRAMS FOR ASSESSING THE QUALITY OF THE WILLAMETTE RIVER, OREGON,
Geological Survey, Portland, Oreg. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-02301

SIMULATED EFFECTS OF THE PROPOSED TENNESSEE COLONY RESERVOIR ON GROUND-WATER CONDITIONS IN THE CARRIZO-WILCOX AQUIFER AND TRINITY RIVER ALLUVIUM, TEXAS,
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-02305

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 1. NORTH ATLANTIC SLOPE BASINS--VOLUME 3. BASINS FROM MARYLAND TO YORK RIVER.
Geological Survey, Reston, Va. Water Resources Div.
Available from Branch of Distribution, USGS, 1200 S. Eades St., Arlington, VA, 22202, price $7.00. Geological Survey Water-Supply Paper 2103, 1976. 971 p, 1 fig.

Descriptors: *Hydrologic data, *Surface waters, *Streamflow, *Lakes, Delaware, Maryland, New York, Pennsylvania, Virginia, West Virginia, Basic data collections, Runoff, Discharge(Water), Gaging stations, Flow measurement, Flow rates, Reservoirs.
Identifiers: *North Atlantic slope basins, Reservoir content.

This report is one of a series of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the North Atlantic slope basins, Maryland to York River. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. Data for partial-record stations are presented in two tables. The first is a table of discharge measurements at low-flow partial-record stations, and the second is a table of annual maximum stage and discharge at crest-stage stations. Occasionally, a series of discharge measurements are made within a short time period to investigate the seepage gains or losses along a reach of a stream or to determine the low-flow characteristics of an area. Such measurements are given in special tables. For a lake or reservoir station, capacity tables giving the contents for any stage are prepared from stage-area relation curves defined by surveys. The application of the stage to the capacity table gives the contents, from which the daily, monthly, or yearly change in contents is computed. (Woodard-USGS)
W77-02307

THE MERIDIAN-UPPER WILCOX AQUIFER IN MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
E. H. Boswell.
Water-Resources Investigations 76-79 (open-file report), June 1976. 3 sheets, 19 fig, 3 tab, 17 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water yield, *Water quality, *Mississippi, Hydrologic data, Water wells, Pumping, Hydrogeology, Drawdown, Groundwater recharge, Water utilization, Water supply, *Maps.
Identifiers: *Wilcox Group, Tallahatta Formation.

The Meridian-upper Wilcox aquifer contains freshwater in a 15,000 sq mi area in northwestern and central Mississippi. The aquifer comprises the Meridian Sand Member of the Tallahatta Formation and discontinuous hydraulically connected sand beds in the upper part of the Wilcox Group. The aggregate sand thickness of the aquifer ranges from less than 50 ft to about 500 ft. The withdrawal of fresh water from the aquifer in Mississippi in 1975 was about 32 Mgal/d. Long-term water-level trends indicate an average decline of about 1 ft per year. Thick, permeable sand beds yield as much as 2,800 gal/min to wells and fresh water extends to depths of more than 2,000 ft. The aquifer is used extensively in areas where the dissolved-solids content exceeds 500 mg/liter; however, the most common problems in water supplies are excessive iron and corrosiveness. (Woodard-USGS)
W77-02310

DEPTH TO WATER TABLE, RECHARGE AREAS, DRAINAGE BASINS, AND RELIEF OF DUVAL COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
L. V. Causey.
Water-Resources Investigations 52-75 (open-file map), 1975. 4 sheets, 4 maps.

Descriptors: *Hydrologic data, *Surface waters, *Groundwater, *Water level fluctuations, *Groundwater recharge, Drainage area, Topography, *Maps.
Identifiers: *Duval County(Fla).

This 3-sheet map report depicts hydrologic systems of surface water and groundwater in Duval County, Florida. The maps are from

1:20,000 and 1:62,500 quadrangles, U.S. Geological Survey. Symbols and colors describe water levels, groundwater recharge, drainage areas, and topography. (Woodard-USGS)
W77-02311

MAPS SHOWING GROUND-WATER CONDITIONS IN THE LOWER BIG CHINO VALLEY AND WILLIAMSON VALLEY AREAS, YAVAPAI AND COCONINO COUNTIES, ARIZONA,
Geological Survey, Tucson, Ariz. Water Resources Div.
B. L. Wallace, and R. L. Laney.
Water-Resources Investigations 76-78 (open-file report), June 1976. 2 sheets, 2 maps, 2 ref.

Descriptors: *Groundwater, *Water levels, *Pumping, *Water quality, Specific conductivity, Fluorides, *Maps, *Arizona.
Identifiers: Yavapai and Coconino Counties(Ariz), Lower Big Chino Valley area, Williamson Valley area.

Arizona is divided into 67 ground-water areas, and individual areas are selected for intensive data collection once every 6 years. The data collected in the lower Big Chino Valley and Williamson Valley areas are given on maps that show depth to water, well depth, and altitude of the water level, 1975-76; pumpage, 1950-74; and specific conductance, fluoride concentration, and irrigated area, 1974. Scale 1:125,000. (Woodard-USGS)
W77-02312

STRATIGRAPHY OF THE PALEOCENE AND LOWER PART OF THE EOCENE IN WESTERN TENNESSEE,
Geological Survey, Nashville, Tenn. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-02315

A BIVARIATE-REGRESSION MODEL FOR ESTIMATING CHEMICAL COMPOSITION OF STREAMFLOW OR GROUNDWATER,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-02317

WATER RESOURCES INFORMATION NEEDS FOR THE SUWANNEE RIVER WATER MANAGEMENT DISTRICT,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-02318

NATIONAL ENVIRONMENTAL STATISTICAL REPORT,
Mitre Corp., McLean, Va.
L. Duncan, D. Elcock, and G. Hollins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 233, Price codes: A12 in paper copy, A01 in microfiche. Technical Report MTR-6957, October 1975. 265 p. 210 tab. 2930. CEQ F 19628-76-C-0001.

Descriptors: *Data collections, *Statistics, Air pollution, *Water quality, Land use, Solid wastes, Recycling, Pesticides, Toxicity, Agriculture, Forests, Wildlife, Food abundance, Water resources, Recreation, Energy, Mineralogy, Transportation, Human population, Economics, *Water pollution.
Identifiers: *Environmental quality, Demography, Housing, Environmental impact statements, Noise pollution.

A variety of environmental and related data available as of May 1975 from various sources are presented in approximately 200 statistical and summary tables. Three kinds of general data categories are included: (1) basic environmental categories, (2) categories which provide data directly related to environmental quality, and (3) data categories which are frequently compared to or used in the analysis of environmental data. The tables are arranged by data type under 16 subject categories. These are: air quality, water quality, land use, solid waste and recycling, pesticides and toxic substances, agriculture and food supply, forests and wildlife, water resources, recreation, minerals, energy, transportation, housing, demography, economics, and environmental impact statements. In order to ensure continuity between this publication and future updates, data which are collected and updated on a regular basis were selected. All 50 states and the District of Columbia are represented by the data, as well as a few tables of international data to give perspective to the United States data. A comprehensive index facilitates the identification of data. (Luedtke-Wisconsin)
W77-02447

AN EVALUATION OF WATER QUALITY INFORMATION: A CASE STUDY OF STREAMS IN METROPOLITAN NEW JERSEY,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Geography.
For primary bibliographic entry see Field 5A.
W77-02448

MATHEMATICAL MODELS IN HYDRAULICS AND COASTAL ENGINEERING,
International Courses in Hydraulic and Sanitary Engineering, Delft (Netherlands).
For primary bibliographic entry see Field 2A.
W77-02471

LARGE-SCALE CURRENT MEASUREMENTS IN LAKE HURON,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2H.
W77-02473

THE ANNUAL VOLUME OF U.S. PRECIPITATION AND ITS VARIATIONS FOR THE PERIOD 1931-1971,
Eastern Washington State College, Cheney. Dept. of Physics.
For primary bibliographic entry see Field 2B.
W77-02483

SKYLAB IMAGERY: APPLICATION TO RESERVOIR MANAGEMENT IN NEW ENGLAND,
Cold Regions Research and Engineering Lab., Hanover, N.H. Research Div.
For primary bibliographic entry see Field 4A.
W77-02499

RETRANSMISSION OF HYDROMETRIC DATA IN CANADA,
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.
R. A. Halliday.
Report NASA-CR-146322, Quarterly Report SR 28190, January 1976. 7 p, 1 fig, 2 tab.

Descriptors: *Satellites(Artificial), *Meteorological data, *Canada, Hydrologic data, Water resources, Flood forecasting, Water levels, On-site data collections, Inflow, Data collections, Computers.
Identifiers: *Data collection platforms, *LANDSAT, Hydrometric data, Test site, Solar panel, Retransmission.

Data collection platforms (DCPs) had been installed at 17 sites in remote areas of Canada for transmittal of water level and other water resources data. The near real time data were used for water management purposes. The system met all requirements, and the suitability of satellite retransmission was demonstrated. Capital costs of the equipment installed at gaging stations were reasonable, and indications were that the DCPs did not require much maintenance. The potential impact of this technology on water resources data gathering activities was thought to be considerable. It was concluded that more work with quasi-operational programs is needed to determine the benefits precisely. (Roberts-ISWS)
W77-02506

8. ENGINEERING WORKS

8A. Structures

THE DESIGN AND TEST OF A SAFE AND EFFECTIVE STORM-SEWER INLET,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 8B.
W77-02186

TANKS OF PANEL CONSTRUCTION.
Water and Waste Treatment, Vol. 19, No. 7, p 26, July, 1976.

Descriptors: *Sewage treatment, *Aeration, Equipment, *Construction, Materials, Materials engineering, Waste water treatment.
Identifiers: Clarification tanks, *Aeration tanks.

A Diapac sewage treatment unit constructed of modular tank panels is described. The Diapac unit consists of two tanks, each designed for both aeration and clarification. Since tank construction is based on the use of modular tank panels which are prefabricated and produced in standard size, erection of the tanks consists of a simple bolting up and sealing operation. The tanks can also be taken down and installed at another site with relative ease. (Kreager-FIRL)
W77-02325

AUSTIN'S 11 MILE SEWER TUNNEL REFLECTS SOUND ECONOMIC, ENVIRONMENTAL ALTERNATIVES,
Austin City Dept. of Construction Management, Tex.
For primary bibliographic entry see Field 5D.
W77-02327

8B. Hydraulics

SCOURING OF COHESIVE SOILS,
Howard Univ., Washington, D. C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W77-02127

GRID TURBULENCE IN HYDRAULIC MODELS,
Windsor Univ. (Ontario). Dept. of Engineering.
J. A. McCorquodale, and A-A. A. Hannoura.
Journal of Hydraulic Research, Vol. 14, No. 3, p 207-216, 1976. 7 fig, 2 tab, 11 ref.

Descriptors: *Turbulence, *Laboratory tests, *Froude number, *Hydraulic similitude, *Viscosity, Hydraulic models, Momentum transfer, Boundary layers, Theoretical analysis, Sluice gates, Air entrainment, Equations.
Identifiers: *Free stream turbulence, Contraction coefficient, Vena contracta.

It is commonly believed that behavior of most free surface hydraulic models is adequately described by the Froude Law if Reynolds number exceeds a

certain minimum value. However, free stream or grid turbulence may cause apparent scale effects that are even greater than the viscous effects. The higher turbulence levels in the model can result in excessive momentum transfer in zones of highly curvilinear flow. A laboratory model was constructed to obtain a correlation between the free stream turbulence levels and the measured contraction coefficient below sharp-edged sluice gates. The experimental studies indicated that (1) the free stream turbulence can significantly increase the vena contracta in sluice gate models, (2) the flat plate boundary layer displacement theory is not sufficient to explain the discrepancies between the experimental and theoretical values of the coefficient of contraction, (3) the kinematic viscosity model gives a reasonable explanation for the turbulence effect on the coefficient of contraction, and (4) further research is needed to assess the effect of air entrapment on the vena contracta. (Singh-ISWS)
W77-02128

ON THE RELIABILITY OF THE SPECTRAL METHOD FOR THE DESIGN OF OFFSHORE STRUCTURES,
Technische Universitaet, Munich (West Germany). Institut fuer Bauinzenieurwesen III.
G. I. Schueller.
Journal of Hydraulic Research, Vol. 14, No. 3, p 229-240, 1976. 4 fig, 3 tab, 20 ref, 1 append.

Descriptors: *Offshore platforms, *Waves(Water), *Tsunamis, *Wind tides, *Time series analysis, Mathematics, Coastal structures, Statistical methods, Loads(Forces), Ocean waves, Filters.
Identifiers: *Spectral method, Dynamic amplification factor, Wave force.

Spectral analysis is a useful tool for the design of structures subject to time-dependent stochastic loading as exerted by wind-generated water surface waves. Two major uncertainties have to be considered: the variation of the wave height spectrum given a time history of a water surface measured at a fixed point, and the dispersion of the wave force spectrum given the wave height spectrum. The second uncertainty and its influence on the dynamic amplification factor were discussed in this paper. The size of resolution and degree of confidence of spectral estimates as well as the filtering process were found to be important for the spectral shape, particularly in the subrange significant for structural design of dynamically excited linear systems. The coefficients of drag and inertia are radom variables. The effect of their dispersion on the variation of the force spectral estimate in terms of exceedance probabilities of the dynamic wave loads - using similarity wave height spectra - was discussed. The analysis was illustrated utilizing a template steel platform in 550 feet of water as a sample structure. (Singh - ISWS)
W77-02129

GEOMETRY OF RIPPLES AND DUNES IN ALLUVIAL CHANNELS,
Roorkee Univ. (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W77-02130

SYNTHETIC DESIGN HYETOGRAPH AND RATIONAL RUNOFF COEFFICIENT,
American Consulting Services, Inc., Minneapolis, Minn. Environmental Engineering.
For primary bibliographic entry see Field 2E.
W77-02135

FLOW CONTROL AND TRANSIENTS IN THE CALIFORNIA AQUEDUCT,
California State Dept. of Water Resources, Sacramento. Div. of Operations and Maintenance.
H. G. Dewey, Jr, and W. R. Madsen.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 102, No. IR3, Proceedings Paper 12434, p 335-348, September 1976. 10 fig, 1 tab, 2 ref, 1 append.

Descriptors: *California, *Control systems, *Flow control, *Gates, Water supply, Aqueducts, Hydraulics, Operations, Water conservation, Water distribution(Applied), Channels, Open channels.
Identifiers: *California State Water Project, *Gate operation, Operational procedures.

From initial operation of the California Aqueduct of the California State Water Project in 1967 to the present, the method of gate operation for flow control has been modified to keep up with the changing operational demands. Initially serial gate operation was employed. Then, as operating demands increased, a new method called simultaneous gate operation which uses the controlled volume concept was implemented. As flow changes increased, still another method, known as timed gate operation which is another variation of the controlled volume concept, was initiated. This latest method satisfies all present operating requirements and is expected to meet all future operating requirements. Recent flow change tests indicated that timed gate operation will control the fluctuations within the allowable limits for flow changes up to and including designed flow quantities in the range of 13,100 cfs (370 cu m per sec). Refinement to the timed gate operation can further reduce the magnitude of hydraulic transients during major flow changes. (Lee-ISWS)
W77-02136

INVESTIGATION OF TWO-REGIME WELL FLOW,
University Coll. of Swansea (Wales).
For primary bibliographic entry see Field 4B.
W77-02142

THEORETICAL MONOCHROMATIC-WAVE-INDUCED CURRENTS IN INTERMEDIATE WATER WITH VISCOSITY AND NONZERO MASS TRANSPORT,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
For primary bibliographic entry see Field 2L.
W77-02159

MINIMIZING COSTS IN WELL FIELD DESIGN IN RELATION TO AQUIFER MODELS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
C. A. Bostock.
Ph.D. Dissertation, 1975. 144 p, 14 fig, 48 ref, append.

Descriptors: *Cost analysis, *Water wells, *Model studies, *Aquifer management, Permeability, Pumping, Well spacing, Groundwater mining, Cost allocation.
Identifiers: *Aquifer models, *Aquifer permeability.

Well field design costs are minimized by the well density-capacity combination used to meet groundwater demand. A well design method discussed accounts for lateral variations in aquifer permeability, but not water benefits or transmission lines for water and power. All wells are equally spaced in a grid pattern and have the same design. Cost determination and distribution are discussed. The aquifer selected to demonstrate this method is unconfined and, except for permeability, is uniform laterally. Groundwater mining occurs during the annual pumping season. The method is defined and illustrated using the assumption of a homogeneous aquifer, with all wells operating simultaneously at equal discharge rates. The influence of nonuniform permeability is analyzed, along with inter-cell flow effects due to possible distributions of heterogeneous permeability and non-simultaneous pumping. The method described for illustration is considered applicable to aquifer and climatic conditions like those in Bangladesh. Equations are given for estimating errors associated with approximating the boundary shapes of hexagonal, square and equilateral cells by a circle of equal area. (Jahns-Arizona)
W77-02161

THE DESIGN AND TEST OF A SAFE AND EFFECTIVE STORM-SEWER INLET,
Kansas Water Resources Research Inst., Manhattan.
Y. S. Yu.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 345, Price codes: A04 in paper copy, A01 in microfiche. Contribution No. 183, August 1976. 42 p, 8 fig, 28 tab, 2 ref, append. OWRT A-076-KAN(1). 14-34-0001-6017.

Descriptors: *Design *Testing, Storm water, *Storm drains, *Intakes, Interceptor sewers, Drains, Slopes, Road design, *Sewers.
Identifiers: Grates, Curbs, Scale models.

A new combination inlet for storm water was designed and tested on a 1:4 scale model to determine its hydraulic efficiency. Experimental results obtained from two transverse slopes, 1/48 and 1/32, and seven longitudinal slopes equal to 0.006, 0.01, 0.02, 0.03, 0.04, 0.06 and 0.08 shows that the new inlet maintains, relatively high intercept ratio over a wide range of these variables at low as well as high total discharges. Prototype tests are recommended to insure that this new inlet is also bicycle-safe.
W77-02186

DILUTION AND DESIGN,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5E.
W77-02332

PARTIAL WAVE DAMPING IN PNEUMATIC BREAKWATERS,
Royal Norwegian Air Force Academy, Trondheim.
I. Brevik.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY9, Proceedings Paper 12374, p 1167-1176, September 1976. 4 fig, 7 ref, 2 append.

Descriptors: *Breakwaters, *Hydraulics, *Waves(Water), *Theoretical analysis, Ocean waves, Wavelengths, Turbulence, Dispersion, Energy loss, Analytical techniques.
Identifiers: *Hydraulic breakwaters, Power consumption, Wave amplitude.

Power consumption in pneumatic (or hydraulic) breakwaters is very large if complete stopping of the oncoming waves is to be achieved. Partial damping of the oncoming waves can be attained if supplied power to pneumatic breakwaters is less. A theoretical analysis of the problem was attempted considering the available breakwater and amplification variation theories. The theory predicted no damping at all until the opposing current is sufficiently strong to give wave stopping. If the current exceeds the breaking limit, it was found convenient to divide the whole breakwater into three distinct regions. Reasonable agreement with the large-scale pneumatic experiments of Bulson was obtained. (Singh-ISWS)
W77-02455

EVALUATION OF CIRCULATION IN ESTUARIES,
Lawler, Matusky and Skelly Engineers, Tappan, N. Y.
For primary bibliographic entry see Field 2L.
W77-02456

OBLIQUE IMPINGEMENT OF PLANE TURBULENT JETS,
Research Council of Alberta, Edmonton. Highway and River Engineering Div.
S. Beltaos.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY9, Proceedings Paper 12388, p 1177-1192, September 1976. 14 fig, 1 tab, 31 ref, 2 append.

Descriptors: *Jets, *Turbulence, *Shear stress, *Hydrodynamics, *Momentum transfer, *Pressure, Nozzles, Potential flow, Model studies, Analytical techniques, Reynolds number.
Identifiers: *Oblique impingement, Static pressure, Wall pressure.

Wall pressure and shear stress in the impingement region were studied experimentally, and semi-empirical methods for their prediction were developed. The solutions of the corresponding potential flow problem were used to obtain satisfactory estimates of the eccentricity of the stagnation point. The similarity analysis of the classical wall jet was employed for the wall jet region. Analytical results were substantiated using existing data. The local skin friction factor was shown to be independent of impingement height and angle but to decrease as the -1/5 power of the jet Reynolds number. The wall jet thickness grows linearly at a slope that depends slightly on the Reynolds number. For Reynolds numbers over 20,000, the maximum wall jet velocity decreases as the inverse square root of distance and is independent of the impingement height. The effect of the impingement angle on the velocity was evaluated using the momentum equation and a potential flow analogy. (Singh-ISWS)
W77-02464

MATHEMATICAL MODELS IN HYDRAULICS AND COASTAL ENGINEERING,
International Courses in Hydraulic and Sanitary Engineering, Delft (Netherlands).
For primary bibliographic entry see Field 2A.
W77-02471

WATER MOTION ON A BEACH IN THE PRESENCE OF A BREAKWATER: 1. WAVES,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Environmental Engineering.
P. L. F. Liu, and C. C. Mei.
Journal of Geophysical Research, Vol 81, No 18, p 3079-3084, June 20, 1976. 6 fig, 7 ref. Army DACW-72-72C-0023.

Descriptors: *Waves(Water), *Beaches, *Breakwaters, Refraction(Water waves), Reflectance, Ocean waves, Coasts, Equations, Shores, Model studies, Numerical analysis, Mathematical models, Wavelengths, Estuaries, Oceanography.
Identifiers: *Wave diffraction.

For a long breakwater on a slowly varying bottom, an asymptotic theory was given which accounts for the combined effects of refraction and Fresnel diffraction of water waves. Numerical examples were given for two cases: an offshore breakwater and an isolated jetty. (See also W77-02475) (Sims-ISWS)
W77-02474

WATER MOTION ON A BEACH IN THE PRESENCE OF A BREAKWATER: 2. MEAN CURRENTS,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Environmental Engineering.
P. L-F. Liu, and C. C. Mei.
Journal of Geophysical Research, Vol 81, No 18, p 3085-3094, June 20, 1976. 7 fig, 22 ref. Army DACW-72-72C-0023.

Descriptors: *Currents(Water), *Waves(Water), *Beaches, *Breakwaters, Refraction(Water waves), Coasts, Shores, Model studies, Numerical analysis, Mathematical models, Ocean waves, Water circulation, Estuaries, Oceanography.
Identifiers: *Wave diffraction.

A semi-empirical theory of breaking-induced mean currents on a beach was developed to study the combined effects of refraction and diffraction. With the omission of convective inertia and lateral turbulent diffusion, the resulting averaged equations were solved by finite differences. The case of an offshore breakwater was studied in detail, and the predicted current pattern was found to be consistent with laboratory observations and the known tendency of tombolo formation near sandy beaches. Numerical results for an isolated breakwater extending from the shore were also presented, and observational evidences cited. (See also W77-02474) (Sims-ISWS)
W77-02475

MARYLAND HIGHWAY DRAINAGE STUDY: VOLUME I - SUMMARY REPORT,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W77-02490

MARYLAND HIGHWAY DRAINAGE STUDY: VOLUME II - A COMPARISON OF MARYLAND HIGHWAY DRAINAGE PRACTICES WITH THOSE OF OTHER AGENCIES,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W77-02491

MARYLAND HIGHWAY DRAINAGE STUDY: VOLUME III - A LINKED SYSTEM MODEL FOR THE SYNTHESIS OF HYDROGRAPHS IN URBAN AREAS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W77-02492

MARYLAND HIGHWAY DRAINAGE STUDY: VOLUME VI - AN EXPERIMENTAL EXAMINATION OF THE SUBSURFACE DRAINAGE OF ROADWAYS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W77-02493

RISK-SAFETY FACTOR RELATION FOR STORM SEWER DESIGN,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-02551

8C. Hydraulic Machinery

LOCK WALL DEICING WITH WATER JETS: FIELD TESTS AT SHIP LOCKS IN MONTREAL, CANADA AND SAULT STE. MARIE, MICHIGAN,
National Research Council of Canada, Ottawa (Ontario). Div. of Mechanical Engineering; and National Research Council of Canada, Ottawa (Ontario). Gas Dynamics Lab.
W. H. Brierly, D. J. Calkins, S. L. DenHartog, M. Mellor, and H. T. Ueda.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-021 768, Price codes: A02 in paper copy, A01 in microfiche. Cold Regions Research and Engineering Laboratory Special Report 239, December 1975. 17 p, 9 fig, 3 tab, 4 ref.

Descriptors: *Locks, *Deicers, *Jets, *Ice, Nozzles, High pressure, Water, Hydraulics, Structures, Operation and maintenance, Maintenance costs, Equipment, Navigation, Ships, Channels.
Identifiers: *Ice removal, Ship locks, High-pressure water jets.

Tests were made to evaluate a proposed technique for removing ice from lock walls during winter navigation. The technique involved use of a high-pressure water jet to slice through ice collars that adhere to vertical walls. The test equipment consisted of (1) a jet lance tipped with a nozzle designed to produce a long coherent jet, (2) a small tractor (hydraulically driven) to carry the lance, and (3) a high-pressure pump unit to supply water to the lance. Tests were made with operating pressures from 3,000 to 14,000 lbf/sq in and nozzle diameters from 0.063 to 0.152 in. Most of the work involved pressures around 9000 lbf/sq in and nozzle diameters of approximately 0.09 in. Traverse speeds were in the range 3 to 17 ft/min. Jet penetrations of up to 4 ft were achieved in a single pass, and the equipment proved capable of cleaning the lock wall under the prevailing conditions. However, performance was somewhat less favorable than had been predicted, and a revised scheme involving changes in lock operating procedures was proposed. (Sims-ISWS)
W77-02156

CONSTRUCTION OF GOSCOTE SEWAGE PUMPING STATION,
M. L. Cooper.
Proceedings of the Institution of Civil Engineers, Vol. 60, Part 1, p 345-365, August, 1976. 16 fig, 3 tab, 8 ref.

Descriptors: *Sewage treatment, *Pumping plants, *Construction, *Structural design, *Concrete structures, Design criteria, Treatment facilities, Materials.

The construction of a substructure for a raw sewage pumping station in Great Britain is described. The substructure consisted of a circular cofferdam (38 m in diameter and 15 m deep). The notable feature of the substructure was the employment for the first time at such a large scale of a precast concrete bolted segmental lining. Although the circular cofferdam had the disadvantage of requiring a relatively large amount of over-excavation and backfilling, it had the overwhelming advantage of providing an unobstructed working space. Specific details of the design and construction of the cofferdam are presented. (Kreager-FIRL)
W77-02326

ALARM SYSTEM CONTINUALLY MONITORS PLANT FUNCTIONS,
A. Hartenstein.
Public Works, Vol. 107, No. 9, p 86, September, 1976.

Descriptors: *Monitoring, *Treatment facilities, *Automation, *Failures, *Computers, Waste water treatment, Water treatment, Pumping plants, Costs.

An alarm system for continuously monitoring the functions of water and waste water treatment plants as well as pumping stations is described. During normal working hours, the alarm system is activated by a master control panel and dials a designated telephone number for the reporting of alarm conditions. Should a malfunction occur, one of 18 radio-equipped trucks will respond to the alarm. During non-working hours, the monitoring system activates a computer connection with the telephone company which automatically forwards the original call to a second telephone number via a telephone call diverter so that standby personnel who are available on a 24-hour basis can respond to the alarm. Functions that can be tied into the system include: low dissolved oxygen, high

suspended solids, low chlorine residual, chlorine leaks, power failures, low pressure, and loss of air to a waste water treatment plants. The one-time charge for installing the system averages out to $1750 per installation with a monthly charge of $39.00 for telephone equipment. (Kreager-FIRL)
W77-02382

8D. Soil Mechanics

ELASTIC-PLASTIC STABILITY ANALYSIS OF MINE-WASTE EMBANKMENTS,
Bureau of Mines, Spokane, Wash. Spokane Mining Research Center.
E. L. Corp, R. L. Schuster, and M. M. McDonald.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 694, Price codes: A06 in paper copy, A01 in microfiche. Report of Investigation 8069, 1975. 104 p, 56 fig, 6 tab, 124 ref, append.

Descriptors: *Mine wastes, *Dams, *Spoil banks, Seepage, Stability, Dam failure, Mining engineering, Soil mechanics, Finite element analysis, Computer models, Model studies, Strength of materials, Soil strength, Soil physics, Engineering.

Seepage forces computed by a finite-element flow program were combined with gravity forces in an elastic-plastic stress-analysis program to determine the stability of mine-waste slopes. Computer output provided a cross-sectional plot of the dam or embankment showing the safety factors for each element. The combined finite-element program called SEEP-SLOPE was used to analyze several trial embankments and the 1972 Buffalo Creek Dam failure. Safety factors computed by the finite-element method (FEM) were compared with those computed by the Bishop limiting-equilibrium method. For individual slip circles, there was little correlation between the factors of safety computed by the two methods. Both predicted failure, but FEM shows a different mode of failure plus development of potential failure zones not indicated by conventional methods. Besides having a better theoretical basis than the Bishop method, FEM requires no assumptions regarding the location or geometry of the failure surface. As a result, the program will show progressive development of a failure zone, and areas can be pinpointed where remedial measures should be taken. In addition, nonhomogeneous cross sections can be analyzed, and zones of potential piping can be defined. (Sims-ISWS)
W77-02502

AN EXPERIMENTAL HIGH-ASH PAPER MILL SLUDGE LANDFILL: SECOND ANNUAL REPORT,
Michigan State Univ., East Lansing. Div. of Engineering Research.
For primary bibliographic entry see Field 5E.
W77-02555

AN EXPERIMENTAL HIGH-ASH PAPER MILL SLUDGE LANDFILL: FIRST ANNUAL REPORT,
Michigan State Univ., East Lansing. Div. of Engineering Research.
For primary bibliographic entry see Field 5E.
W77-02556

8E. Rock Mechanics and Geology

THURROCK BEATS PEAT WITH PILED PIPES,
B. Appleton.
New Civil Engineer, Vol. 19, No. 207, p 24, August, 1976.

Descriptors: *Sewers, *Construction, *Design criteria, *Peat, *Piles(Foundation), Hydraulic structures, Conveyance structures, Foundation failure, Foundations, Pipes, Geology, Conduits.

The installation of new sewers supported by piles in an area where old sewers were adversely affected by peat layers up to 11 meters deep which overlay weathered chalk is described. Piling was decided upon since any form of conventional bedding would eventually settle unevenly as the peat alternately swelled and shrank with movements in the water table. Construction was simplified by selecting just two pile spacings (5 m and 10 m), two pipe diameters (300 mm and 450 mm), and a constant beam depth (1 m). Beam widths were 600 mm for the smaller pipe diameter and 750 mm for the larger pipes. The problem of supporting the pipe inside a reinforcement cage during concreting was solved by using a Williams form tie fastened at one end to a circular clamp around the pipe and at the other end to a worm thread adjuster clamped to a modified horizontal Acrow prop. Spaced at 1.2 m centers, the brackets allowed any deflection of the pipe to be corrected during concreting. (Kreager-FIRL)
W77-02328

8F. Concrete

PRECAST SEGMENTS SPEED INSTALLATION OF THUNDER BAY SEWER,
Engineering and Contract Record, Vol. 89, No. 10, p 22-23, October, 1976.

Descriptors: *Sewers, *Tunneling, *Construction, *Concrete pipes, *Hydraulic structures, Municipal wastes, Conveyance structures, Materials, Canada.
Identifiers: Thunder Bay(Ont).

The use of non-reinforced precast concrete segments for an 85-inch diameter section of the Neebing-McIntyre sanitary trunk sewer in Thunder Bay, Ontario is reported. The main advantage of the system is that both the primary lining and secondary poured concrete section usually used in soft ground are replaced by a one-step installation of segments. One tunnel ring consists of four segments, each 4.33 in thick, 39.3 in long, and weighing 1000 pounds. They are erected by a mechanical arm attached to a 97-inch mole. The rate of advance is as much as 50 ft of finished tunnel per 8-hour shift. Materials handling is essentially the same as in conventional tunneling systems. One major difference is that the segments are considerably larger, and it is thus necessary to exercise greater care to ensure that they do not obstruct the tunnel passageway or foul the conveyor support assembly. (Kreager-FIRL)
W77-02330

DIGESTION IS A GOOD EGG IN LOS ANGELES,
For primary bibliographic entry see Field 5D.
W77-02365

8G. Materials

KAISER EFFECT IN SNOW,
Montana State Univ., Bozeman.
For primary bibliographic entry see Field 2C.
W77-02154

LOCK WALL DEICING WITH WATER JETS: FIELD TESTS AT SHIP LOCKS IN MONTREAL, CANADA AND SAULT STE. MARIE, MICHIGAN,
National Research Council of Canada, Ottawa (Ontario). Div. of Mechanical Engineering; and National Research Council of Canada, Ottawa (Ontario). Gas Dynamics Lab.
For primary bibliographic entry see Field 8C.
W77-02156

FOURTH SEMIANNUAL INTERAGENCY BRIEFING, FEBRUARY 1975, WASHINGTON, D.C.,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
R. T. Saucier, and M. K. Vincent.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A017 556, Price codes: A06 in paper copy, A01 in microfiche. Miscellaneous Paper D-75-14, 112 p, October 1975. 2 append.

Descriptors: *Dredging, *Coastal marshes, *Projects, *Disposal, Engineering geology, Coasts, Coastal engineering, Coastal plains, Marsh management, Marsh plants, Research and development, On-site investigations, Laboratory tests.
Identifiers: *Dredged material, Disposal operations project, Reuse research, Containment, Artificial marsh creation.

Presented are edited texts and prints of slides of the February 1975 briefing on the status of the Dredged Material Research Program (DMRP) that took place at the United States Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. This was the largest and most diverse environmental research program undertaken to that time by the Corps, and it held the highest priority of any research effort at the Waterways Experiment Station. The briefing summarized the operation, organization, management, and funding of the DMRP and highlighted the issues of dredging and disposal. Research problems, accomplishments, and objectives were discussed in relation to work units within the four projects that structure the DMRP: the Aquatic Disposal Project, the Habitat Development Project, the Disposal Operations Project, and the Productive Uses Project. In February 1975, the DMRP was 40% completed with 37 work units finished and 56 active. The work unit studies, which covered a diversity of problems on the disposal, effects of disposal, and possible uses of dredged material, were conducted in laboratory and field investigations under contract with universities, corporations, and Government agencies throughout the United States. (Roberts-ISWS)
W77-02158

TEST NEW SEWERS WITH LOW-PRESSURE AIR,
W. S. Foster.
American City and County, Vol. 91, No. 10, p 102, October, 1976.

Descriptors: *Sewers, *Construction, *Testing procedures, *Pressure, *Hydraulic structures, Conduits, Conveyance structures, Pipes.

A low-pressure air test for determining the integrity of newly constructed sewers is described. Under the test procedure, the sewer line should be flushed and cleaned with the interior walls moist. The line should be plugged, including the laterals and outlets. Air under pressure is then introduced to a point where the pressure at the test line registers 4.0 pounds/sq in and is then allowed to stabilize until it reaches a figure of 3.5 pounds/sq in or slightly above. The pressure drop over a specified test period is then recorded; if the pressure drops more than 1 pound/sq in, the line has failed. The specified test period is determined by the following equation: test time equals (0.085 times the nominal inside pipe diameter)/permissible air loss per sq ft of internal pipe surface. The test time is established on an allowable air loss of 0.003 cu ft/min per sq ft of internal pipe surface with the following restrictions: minimum significant air loss is 2.0 cu ft/min and maximum total allowable air loss is 3.5 cu ft/min. Sewers should be air tested before and after backfill in order to assess the integrity of the installed material and the construction procedures. (Kreager-FIRL)
W77-02329

PLASTIC LINING OVERCOMES RUGGED TERRAIN,
Bement, Dainwood and Sturgeon, San Diego, Calif.
J. F. Dainwood.
Public Works, Vol 107, No 9, p 100-101, September, 1976.

Descriptors: *Sewers, *Repairing, *Plastic pipes, *Hydraulic structures, *Drainage systems, Conduits, Conveyance structures, Cities, Materials, Construction, Costs, California.
Identifiers: La Mesa(Calif).

The use of plastic lining to overcome exfiltration and infiltration problems associated with a 55-year-old, 6-inch concrete sewer line running through rocky terrain in the city of La Mesa, California is described. The repair project involved pulling heat-fused lengths of flexible polyethylene pipe (inside diameter of 4.75 in) through the old line. The pipe was supplied to the job-site in 38-foot sections and heat-fused in lengths necessary to extend from the lead-in pit to pull point. Lateral connections were made with polyethylene plastic saddles and jointed to the existing lateral with mechanical couplings. Manhole-main connections were made with a special grout and existing manholes were not damaged. The city elected to manage the work itself, contracting out only those portions of the project which their own forces could not handle. The final cost to complete the project was $40,000 for the 3400-foot sewer run. (Kreager-FIRL)
W77-02333

EMERGENCY REPAIR OF A DEEP STORM SEWER LINE,
D. M. Weis.
Public Works, Vol. 107, No. 9, p 76-77, September, 1976. 3 fig.

Descriptors: *Sewers, *Repairing, *Storm water, *Concrete structures, *Hydraulic structures, Materials, Linings.

The emergency repair of a 60-inch monolithic concrete storm sewer in imminent danger of collapse is described. The sewer discharges into Lake Michigan, emerging from a bluff in a head wall a short distance from the shore line. A slippage had occurred along the face of the bluff about 110 ft inland from the head wall and extended laterally about 600 ft. This resulted in a shear failure in the sewer along the apparent fault line of the slippage. The existence of the fault was unsuspected until the face of the 90-foot high bluff suddenly dropped a total of 2 ft at the rate of 3-6 in/day. Temporary repair of the sewer with a 48-inch diameter, 3/8 in steel liner plate was performed. Sections of the liner were assembled on the outfall apron, attached to a cable extending through 287 ft of sewer and up to a manhole where a crane could pull the completed pipe or liner into place at the point of the break. A gap of about 1.5 in at the joint of the dropped section was closed by welding. A concrete transition section was poured to anchor the liner, and the front 20 ft was grouted with mortar. A bulkhead was made at the lake end to hold the pea gravel. The remaining annular space was filled with pea gravel or torpedo sand. (Kreager-FIRL)
W77-02350

PACKAGED PLANT FOR VIRGIN ISLANDS.
Water and Waste Treatment, Vol. 19, No. 7, p 22, July, 1976.

Descriptors: *Sewage treatment, *Treatment facilities, *Plastics, *Activated sludge, *Biological treatment, Materials, Construction, Equipment, Design criteria, Aeration, Virgin Islands.

The largest complete sewage treatment plant manufactured out of glass fiber reinforced plastics in the United Kingdom is described. The plant operates by the extended aeration activated sludge process and is capable of serving a population of 500 people. The plant is designed to treat a domestic sewage dry weather flow of 25,000 gallons/day. It consists of a rectangular glass fiber reinforced plastic tank, 11 m by 6 m by 3.5 m, divided into an aeration chamber and a settling chamber of the upward flow type. An adjustable weir controls the overflow rate in the settling chamber and ensures the quiescent conditions necessary for efficient settling. A scum removal system keeps the surface of the settling chamber free from floating solids. Particular advantages of the glass reinforced plastic construction are corrosion resistance and light weight which makes the plant easy to transport and simple to install. (Kreager-FIRL)
W77-02360

GLASS COATED STEEL TANKS.
Water and Waste Treatment, Vol. 19, No. 7, p 23, July, 1976.

Descriptors: *Storage tanks, *Waste water treatment, *Steel structures, *Coatings, *Construction, Materials, Equipment, Corrosion control.

The use of glass-coated steel plates for the construction of tanks used for the storage and treatment of water and waste water is reported. The plates are in standard sizes of 2,730 mm long by 1,445 mm high and in half plate sizes 2,730 mm long by 800 mm high. Each plate is sprayed with glass frit and fired at high temperature. The plates are lap jointed at vertical and horizontal seams with 58 mm lap at the vertical joints and 50 mm lap at the horizontal joints. All laps are sealed using a moisture curing sealant and are then bolted. The steel tanks are erected on reinforced concrete foundations. Tank sizes vary with diameters ranging from 2.558 m to over 30 m and heights ranging from 1.377 m to 11.155 m. The tanks are normally supplied open topped for effluent and water treatment, although coated steel roofs and reinforced butyl rubber debris covers can also be supplied for water and effluent storage. The tanks have a high resistance to corrosion and are simple to erect. (Kreager-FIRL)
W77-02361

SANDWICH CONSTRUCTION G.R.P.
Water and Waste Treatment, Vol. 19, No. 7, p 26, July, 1976.

Descriptors: *Plastics, *Sewage treatment, *Treatment facilities, *Equipment, *Materials, Settling basins, Construction.

The use of sandwich construction glass reinforced plastics in sewage treatment plant equipment is reported. Equipment constructed of glass reinforced plastic includes integral launders in sections fitted to form a circle within final settling tanks as well as similar launders installed in thickening tanks. Glass reinforced plastic offers the advantages of increased strength and a smooth surface which minimizes algal growth. The material is also non-corrosive. (Kreager-FIRL)
W77-02368

ASSESSING SYNTHETIC AND ADMIXED MATERIALS FOR LINING LANDFILLS,
Matrecon, Inc., Oakland, Calif.
For primary bibliographic entry see Field 5E.
W77-02410

THE BEARING CAPACITY OF FLOATING ICE PLATES SUBJECTED TO STATIC OR QUASI-STATIC LOADS,
Princeton Univ., N. J. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2C.
W77-02460

THE APPLICATION OF FRACTURE MECHANICS TO THE PROBLEM OF CREVASSE PENETRATION,
Cambridge Univ., (England). Dept. of Engineering.
For primary bibliographic entry see Field 2C.
W77-02461

SNOW PRESSURE ON RIGID OBSTACLES,
Washington Univ., Seattle. Geophysics Program.
For primary bibliographic entry see Field 2C.
W77-02463

8I. Fisheries Engineering

SWIMMING OF SLENDER FISH IN A NON-UNIFORM VELOCITY FIELD,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 2L.
W77-02155

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WATER RESOURCE PROBLEMS AND RESEARCH NEEDS OF NORTH CAROLINA,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 9D.
W77-02181

9D. Grants, Contracts, and Research Act Allotments

WATER RESOURCE PROBLEMS AND RESEARCH NEEDS OF NORTH CAROLINA,
North Carolina Water Resources Research Inst., Raleigh.
D. H. Howells.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 475, Price codes: A03 in paper copy, A01 in microfiche. Report No. 2 (Revised 7/1/76), July 1, 1976, 39 p. OWRT A-999-NC(49), 14-34-0001-6034.

Descriptors: *Research priorities, Water resources, Conservation, Planning, Pollution abatement, Groundwater, Surface water, *Research and development, *North Carolina, *Education, Training, Colleges, *Universities, Government support, State governments.
Identifiers: *Water resource problems, *Water resource research needs.

A summary of North Carolina's water resource problems and research needs was prepared as a source of orientation for the North Carolina Water Resources Research Institute's research program. The subject matter is presented within the broad categories of water resource planning, water quality management, and water quantity management. The problems and needs discussed represent those areas in which the Institute is attempting to encourage a research response from potential investigators. Current and needed studies and research referred to reflect the collective statewide effort of public agencies, industry, and the university community. Seventy-three priority research needs are identified. (Kiger-North Carolina State)
W77-02181

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

EVALUATION OF THE RING OVEN TECHNIQUE FOR WATER MONITORING, APPENDICES,
Atlantic Research Corp., Alexandria, Va.
For primary bibliographic entry see Field 5A.
W77-02149

ACID MINE DRAINAGE (A BIBLIOGRAPHY WITH ABSTRACTS),
National Technical Information Service, Springfield, Va.
For primary bibliographic entry see Field 5G.
W77-02207

MAINE RIVERS BIBLIOGRAPHY- A USER'S MANUAL,
Research Inst. of the Gulf of Maine, Portland.
R. Harvey, M. W. Hall, P. D. Uttormark, and M. M. Brady.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 495, Price codes: A02 in paper copy, A01 in microfiche.
Maine Land and Water Resources Institute, Orono, Completion Report, October 1976. 12 p. OWRT A-038-ME(1).

Descriptors: *Rivers, *Bibliographies, *Maine, *Streams, *Estuaries, Groundwater, Hydrology, Meteorology, Erosion, Floods, Navigation, Oceanography, Wildlife, Dams, Water supply, Water quality, Fisheries, History, Recreation, Wetlands, Geology, Soils, Dredging, Diversion.

This User's Manual is a companion volume to the Maine Rivers Bibliography and explains bibliography development, its use, and where to obtain materials once they are identified. An introductory section describes and evaluates the original project objectives and their attainment. The collection method is then explained. Accompanying tables detail accept-reject criteria and nationally available document data bases. The bibliography description covers the structure of the individual citations - author, title, source, and code sections - and how a microfiche published Keyword in Context (KWIC) Index, consisting of Keyword Index, Author Index, and Citation Section, can be used. Approximately 4500 citations are indexed. Accompanying tables detail identification codes - sector, source type, time, disciplines, locations - and give samples from the three sections of the KWIC Index. A final tabular presentation lists organizational information sources, the general kinds of information held, and the forms in which they are kept. An appendix contains technical notes on the computer program used to generate the index. The Maine Rivers Bibliography is available on microfiche for a nominal charge from the Environmental Studies Center, University of Maine at Orono.
W77-02224

BIBLIOGRAPHY OF SOVIET LITERATURE ON FRESHWATER HYDROBIOLOGY AND RELATED PROBLEMS: 1974-1975 (ISSUE 19), (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 02I.
W77-02232

ECONOMIC IMPACTS OF WEATHER VARIABILITY,
Missouri Univ., Columbia. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 03B.

W77-02429

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ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE		
Colorado State University, Irrigation Return Flow Quality	W77-02090--02103 02195--02201 02274--02296	44
Cornell University, Policy Models for Water Resources Systems	W77-02123--02126 02549	5
Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W77-02325--02335 02337 02339--02382 02385 02390--02413 02551--02552	83
Illinois State Water Survey, Hydrology	W77-02127--02151 02153--02160 02452--02453 02455--02456 02458--02510	90
Institute of Paper Chemistry, Water Pollution from Pulp and Paper Industry	W77-02553--02575	23
University of Arizona, Arid Land Water Resources	W77-02104 02106--02116 02118--02122 02161--02179 02550	37
University of Wisconsin, Eutrophication	W77-02435--02447 02449--02451	16
University of Wisconsin, Water Resources Economics	W77-02414--02415 02417--02434	20

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B. STATE WATER RESOURCES RESEARCH INSTITUTES	W77-02077--02089 02181--02194 02214--02224 02511 02513--02514 02516--02520 02522--02547	72
C. OTHER		
Agricultural Research Service	W77-02298	1
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Biological Consultant and Information Services (Effects of Pollutants on Aquatic Life)	W77-02202--02213	12
Office of Water Research and Technology	W77-02076, 02180	2
U. S. Geological Survey	W77-02299--02324	26

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